

SECTION 02220

SITE DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6 (1990) Demolition Operations

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI Guideline K (1997) Containers for Recovered
Fluorocarbon Refrigerants

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 82 Protection of Stratospheric Ozone;
Refrigerant Recycling

49 CFR 173.301 Shipment of Compressed Gas Cylinders

DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 Storage and Handling of Compressed Gases
and Liquids in Cylinders

DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M Requisitioning and Issue Procedures

MILITARY STANDARDS (MIL-STD)

MIL-STD-129 (Rev. N) Marking for Shipment and Storage

1.2 MEASUREMENT AND PAYMENT

1.2.1 Pier Superstructure

The demolition and removal of the existing pier superstructure shall include all trusses, firewall, beams, decking, sheds, electrical, plumbing, mechanical works, and other miscellaneous pier elements, and shall be paid for at the contract lump sum price for "Pier Demolition". The lump sum price and payment made shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided. No measurement will be made.

1.2.2 Timber Pile Removal - Class A

Removal and disposal of the timber piles to be completely pulled, as shown, shall be measured for payment per pile removed at the contract unit price for "Timber Pile Removal - Class A". The unit price and payment made shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2.3 Timber Pile Removal - Class B

Removal and disposal of the timber piles to be completely pulled or cut off at the new dredged mud line, as shown, shall be measured for payment per pile removed at the contract unit price for "Timber Pile Removal - Class B". The unit price and payment made shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2.4 Timber Pile Removal - Class C

Removal and disposal of the timber piles to be completely pulled or cut off at a minimum elevation of -30 feet NGVD, as shown, shall be measured for payment per pile removed at the contract unit price for "Timber Pile Removal - Class C". The unit price and payment made shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.3 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations outside of approved areas. Store materials that cannot be removed daily in areas specified by the Contracting Officer. Demolish and remove materials containing asbestos and lead in accordance with Section 13281, "Engineering Control of Asbestos Containing Materials", and the drawings.

1.4 DEFINITIONS

1.4.1 Class I and Class II Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act.

1.5 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-01 Preconstruction Submittals

Locations of Existing Timber Pier Piles;

Submit a survey showing the locations and numbers of all existing timber piles to be removed or cut-off. The survey shall be performed and stamped by a licensed surveyor, and be accurate enough to confirm the as-built drawings and document any additional piles installed since the pier was constructed. The survey shall be submitted in a digital format (AutoCAD *.dwg or *.dxf) and paper format with the proposed pile layout shown as a reference on the same survey drawings. The piles shall be shown located based on the coordinate system shown and include direction of pile batter and slope.

SD-07 Certificates

Demolition plan; G

Notifications;

Submit proposed salvage, demolition and removal procedures to the Contracting Officer for approval before work is started.

SD-11 Closeout Submittals

Receipts;

1.6 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

1.6.1 Receipts;

Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

1.7 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.8 PROTECTION

1.8.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work. Any interference with boat or barge shall be handled through the base control tower.

1.8.2 Existing Work

Protect existing work which is to remain in place, be reused, or remain the property of the Government. Repair items which are to remain or which are to be salvaged, and which are damaged during performance of the work, to their original condition, or replace with new. Do not overload structural elements and pavements to remain. Provide new supports and reinforcement

for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.8.3 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

1.9 BURNING

Burning will not be permitted.

1.10 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Contracting Officer.

1.11 Required Data

Demolition plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Include statements affirming Contractor inspection of the existing pier deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

Remove indicated existing structures as shown. Also, reference attached appendix of photographs for existing conditions. Explosives shall not be used.

3.1.2 Utilities and Related Equipment

Remove existing utilities , as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer. If utility lines are encountered that are not shown on drawings, contact the Contracting Officer for further instructions.

3.1.3 Paving, Slabs and Concrete

Sawcut concrete and asphaltic concrete paving and slabs as indicated along straight lines to a depth equal to the thickness of the concrete pier deck, and not less than 3 inches elsewhere. Provide neat sawcuts at limits of pavement removal as indicated.

3.1.4 Removal of Pier Deck

No part of the structure shall be allowed to fall into the water. Any debris of material that falls in the water must be removed. The pier shall be removed by non-shattering methods. Shattering means any method which would scatter debris. A wrecking ball is not acceptable.

3.1.5 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish.

3.1.6 Air Conditioning Equipment

Remove air conditioning equipment without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990.

Recover all refrigerants prior to removing air conditioning equipment and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.7 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.2 FILLING

Fill holes and other hazardous openings as indicated.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property, and disposed of in accordance with all local, state, and federal regulations. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment listed and indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site as directed within 2 miles of the work site.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting ARI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and dispose of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.

3.3.4.1 Fire Suppression Containers

Fire suppression system cylinders and canisters with electrical charges or initiators shall be deactivated prior to shipment. Also, safety caps shall be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.5 Transportation Guidance

Shipment of all ODS containers shall be in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.4 CLEANUP

3.4.1 Debris and Rubbish

Remove and transport debris and rubbish in a manner and frequency which will prevent spillage on pavements, streets or adjacent areas. Clean up spillage from pavements, streets and adjacent areas.

-- End of Section --

SECTION 02221
EXCAVATION, FILLING AND BACKFILLING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil In-Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1990) Classification of Soils For Engineering Purposes
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock In-Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

VDOT SPECS	(January 1994) Road and Bridge Specifications
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U. S. ARMY, CORPS OF ENGINEERS (COE)

EM 385-1-1	(1996) Safety and Health Requirements Manual
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1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Materials classified by ASTM D 2487 as GW, GP, GM, GC, SW and SP are satisfactory as fill and backfill. The above listed materials plus SM are

satisfactory in-situ. For utilities, satisfactory initial backfill material is as specified in Part 2 - PRODUCTS.

1.2.2 Unsatisfactory Materials

Materials classified by ASTM D 2487 as OL, OH and Pt are unsatisfactory in-situ. Unsatisfactory materials also include those materials containing roots and other organic matter, trash, debris, frozen materials, stones larger than 3 inches in any direction, and material which cannot support equipment or be properly compacted due to excess moisture.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the appropriate test procedure presented in ASTM D 1557, abbreviated hereinafter as percent laboratory maximum density.

1.2.5 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-08 Manufacturer's Instructions Manufacturer's Instructions;

Detailed manufacturers instructions describing use of a product, system or material, including special notices and material safety data sheets, if any, concerning impedance, hazards, and safety precautions.

SD-06 Test Reports Test Reports;

Copies of all laboratory and field test reports shall be submitted directly to the Contracting Officer, from the independent testing lab, within 72 hours of the completion of the test. Required soils tests for fill, backfill, and subgrade materials shall be submitted prior to beginning fill and backfill operations.

1.4 SUBSURFACE DATA

Subsurface soil boring logs are attached to Section 01055 SOIL BORING DATA. The subsoil investigation report and samples of materials taken from subsurface investigations may be examined at the Norfolk District. These data represent the best subsurface information available; however, variations may exist in the subsurface between locations.

PART 2 PRODUCTS

2.1 SELECT GRANULAR MATERIAL

Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1-inch sieve. Maximum size shall be 3 inches.

2.2 INITIAL BACKFILL MATERIAL

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 1 inch or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 1 inch in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

2.3 BRIDGING MATERIAL

Bridging material shall be clean gravel or sandy gravel meeting VDOT Size No. 3 or No. 2, or approved equivalent.

2.4 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6-inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

PART 3 EXECUTION

3.1 DRAINAGE AND DEWATERING

3.1.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed

so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

3.1.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously at least 1 foot below the working level, or deeper as required to continue construction.

3.2 EXCAVATION

All excavation work shall be performed in accordance with the safety criteria of EM 385-1-1. Excavation shall conform to the dimensions and elevations indicated for each structure, and footing except as specified hereinafter, and shall include trenching for utility systems to a point 5 feet beyond the building line of each structure, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material. Payment therefor will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES, except for soil which becomes unsatisfactory due to the action or inaction of the Contractor in the performance of his work. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials, except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations. Satisfactory material shall be placed and compacted as specified in paragraph "FILLING AND BACKFILLING." Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.2.1 Trench Excavation

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed and in full compliance with the safety criteria of EM 385-1-1. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls below the top of pipe shall be made vertical. Trench walls shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in accordance with EM 385-1-1. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter

(O.D.). Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.2.1.1 Bottom Preparation for Utilities

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.2.2 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.2.3 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.2.4 Stockpiles

Stockpiles of satisfactory materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. Excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.3 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

3.4 BLASTING

Blasting will not be permitted.

3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving. All sheet pile shoring systems to be prepared by a registered Professional Engineer and submitted to the Contracting Officer for review and acceptance.

3.6 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3.7 BORROW MATERIAL

Borrow materials shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Borrow materials shall be subject to approval.

3.7.1 Selection

Borrow materials shall be obtained from sources outside the limits of Government-controlled land. The source of borrow material shall be the Contractor's responsibility. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling.

3.8 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of off Government property.

3.9 PREPARATION OF SURFACES FOR FILL

The ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 6 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Aeration shall include disking, harrowing, mixing, and other methods as may be necessary to achieve the proper moisture content.

3.10 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Materials which are unsatisfactory solely due to excess moisture shall be spread, disked, and aerated prior to placing. Satisfactory materials shall

be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Recomposition over underground utilities and heating lines shall be by hand tamping.

3.10.1 Bedding and Initial Backfill for Utilities

Bedding shall be of the type and thickness shown or specified. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.10.2 Final Backfill for Utilities

The remainder of the trench, except for special materials for roadways, shall be filled with satisfactory material, and compacted as specified.

3.11 COMPACTION

Each layer of fill, backfill, and prepared subgrade shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	<u>Cohesive material</u>	<u>Cohesionless material</u>
<u>Fill, subgrade, and backfill</u>		
Under structures, paved areas, around footings, and in trenches	90	95

Compacted surfaces that are disturbed by the Contractor's operations or

adverse weather shall be scarified and recompact as specified at the Contractor's expense prior to further construction thereon. Water flooding or jetting methods of compaction shall not be used.

3.12 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.12.1 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise indicated.

3.12.2 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.13 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Structures shall bear on undisturbed natural subgrade or on compacted fill. Subgrade which becomes disturbed below indicated grade shall be overexcavated and backfilled, as directed, with VDOT SPECS Size No. 57 or No. 21A Stone at the Contractor's expense.

3.14 SOILS TESTS

Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Laboratory tests for moisture-density relations complete with zero air voids curve, gradation, and Atterberg limits shall be made in accordance with the procedures referenced in ASTM D 1557, ASTM D 422, and ASTM D 4318. Field tests for density and moisture content shall be made in accordance with ASTM D 1556 and ASTM D 2216 except that method ASTM D 2922 may be used to supplement tests by method ASTM D 1556. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. When soil conditions exist, such as the presence of mica, which produce inconsistent results by the nuclear gauge method D 2922, only method D 1556 shall be used. Where results by Method D 2922 differ from those by Method D 1556, the results by method D 1556 shall govern for contract compliance.

The following tests are required:

- a. A minimum of one moisture-density test shall be performed for each classification of fill material, backfill material, and existing subgrade material.
- b. One Atterberg limits test and one gradation analysis is required for every six field density tests.
- c. A minimum of one sand cone density test is required for every six nuclear gauge field density tests or fraction thereof. Worksheets of

sand density and sand cone calibration shall be submitted to the Contracting Officer prior to commencing work and each time a new supply of sand is used.

d. A quart jar sample of each moisture-density test material shall be delivered to the Contracting Officer at the time the test is obtained.

e. A pint jar sample of each field-density test material shall be delivered to the Contracting Officer at the time the test is obtained.

f. Field density tests shall be performed as follows: a minimum of one test per lift per 100 linear feet of trench or fraction thereof is required for fill material along a utility, a minimum of one test per lift per 50 square yards or fraction thereof is required for fill material and a minimum of one test per 50 square yards or fraction thereof is required for compacted ground surfaces prior to filling. Locations of all tests shall be at the direction of the Contracting Officer.

3.15 GRADING

Areas shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.16 PROTECTION

Settlement or washing that occurs in graded or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --

SECTION 02362
PRESTRESSED CONCRETE PILING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R (1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

ACI SP-66 (1988) ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 150 (1994) Portland Cement

ASTM C 260 (1986) Air-Entraining Admixtures for Concrete

ASTM D 1143 (1981; R 1987) Piles under Static Axial Compressive Load

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

VDOT (1994) Road and Bridge Specifications

1.2 BASIS FOR BIDS AND PAYMENT

1.2.1 Basis for Bidding

The contract includes a total of 508, 24-inch square piles having a total aggregate length of approximately 60,200 linear feet; dynamic analysis of 7 test piles; mobilization and demobilization for load testing; and two (2) static load test to 350 tons or to failure, whichever occurs first. The piles shall have an ultimate design load of 300 tons. The linear footage of piles is based upon piles driven to the minimum tip elevations shown with top of pile at the elevation determined by the dimensions and elevations of structural components as shown on the structural plans and assumes an additional length of 5 feet per test pile.

1.2.2 Basis for Payment

The Contracting Officer shall have the right to increase or decrease the total aggregate length of piles to be furnished and installed by changing the pile locations or elevations, requiring the installation of additional piles, or directing the omission of piles from the requirements shown and specified. Payment for actual lengths of production piles driven in place from the indicated top of pile elevation to the final tip elevation as installed and approved, will be made at the contract unit price as bid. No

payment will be made for pile length above the indicated pile cutoff elevation, except that payment for that remaining approved length of pile not driven to the required tip elevation at the direction of the Contracting Officer, will be made at the rate of 75 percent of the basic contract unit price bid. The approved length of pile is defined as the length of pile from the indicated top of pile elevation, to the required tip elevation as provided in the Contractor's approved production pile schedule. Payment for the specified length of test piles driven in place will be made at the contract unit price. Piles required to be pulled at no fault of the Contractor will be paid for at the basic contract unit price for furnishing and driving pile in its original position, plus 50 percent of this amount to cover the cost of pulling. Such pulled piles, if redriven, will be paid for at 50 percent of the basic contract unit price for the length driven. Payment for each required and approved pile cut-off will be paid for in accordance with the CHANGES CLAUSE of the Contract.

Full Compensation

Payment is in accordance with the above paragraph "Basis for Payment" shall constitute full compensation for furnishing all labor, material, and equipment incidental to providing the piles as specified and indicated, including mobilization and demobilization. The Contractor will not be allowed separate or additional payment for withdrawn, broken, or rejected piles; for splices; or for cut-offs or build-ups, except as required by conditions beyond the Contractor's control or responsibility and when approved by the Contracting Officer in writing.

Substitute Pile

In the event the Contracting Officer directs the Contractor to install foundation piles of a size different from that specified, the difference in the supplier's market price as of the date of bid opening, between that originally specified and that specified in the change order, shall be multiplied by the total number of linear feet of the substitute pile actually installed and accepted. Payment to the Contractor, in accordance with the preceding paragraph, shall be adjusted upward or downward, as the case may be, by the foregoing amount.

Pile Load Tests

The contract includes two (2) static pile load tests. The Contracting Officer reserves the right to increase or decrease the number of load tests. Payment for each complete test loading of a single pile will be made at the contract unit price per test, which price shall include furnishing, placing, and removing test apparatus and equipment, placing and removing test loads, and furnishing the load test report.

Dynamic Pile Analysis

The contract includes dynamic analysis of seven (7) test piles in accordance with the section "Dynamic Pile Analyses". The Contracting Officer reserves the right to increase or decrease the number of test pile analyses. Payment for each test pile analysis will be made at the contract unit price per analysis, which price shall include furnishing, placing, and removing test sensors and equipment, monitoring test pile installation, performing Wave Equation and CAPWAP analyses, and furnishing the Dynamic Test Pile Report.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Pile Locations and Tolerances; G

The contractor shall furnish drawings, and data in the format of Table A provided at the back of this Section, prepared by a registered licensed land surveyor indicating final location of driven piles.

Pile Driving Equipment;

Descriptions of all pile driving equipment to be employed in the work, prior to commencement of pile installations, including details of the pile hammer, power plant, leads, pile cushion material, helmet or cap, and hammer cushion material. Bounce chamber pressure rating curves or charts shall be submitted for double acting (closed-end)diesel hammers.

Dynamic Testing Equipment;

The Contractor shall submit information on the dynamic load testing equipment proposed to be used, proposed methods of operation, proposed sequence of driving, and details of the pile driving hammer and accessories.

This submittal shall as a minimum:

1. Provide details of the proposed pile driving hammer and a Wave Equation Analysis for selection of the hammer along with a statement of driving procedure. The Wave Equation Drivability Analyses shall be completed by the Contractor's Consultant for pile testing for each test pile location where different subsurface conditions exist, and shall also consider the subsurface conditions, proposed hammer assembly, pile cap block and cushion characteristics, pile properties and estimated lengths. Analyses shall include copies of computer input and output sheets and graphs showing soil resistance versus blow count as well as maximum tension and compression stresses versus blow count. Analyses shall be run at the estimated tip elevation as well as other critical elevations selected by the Contractor's Consultant for pile testing, to define maximum stress levels in the pile during driving.
2. Provide details of the proposed dynamic load testing equipment. The equipment to be used for dynamic testing of the pile hammer and soil performance and for dynamic load testing of the test piles shall be a model GCPC or a PAK Pile Driving Analyzer as manufactured by Pile Dynamics, Inc., of Cleveland, Ohio, or approved equivalent.
3. Provide detailed procedure for conducting the dynamic pile load test, and a description of the information which will be generated by the equipment to be used for conducting the load test. The detailed description shall explain how specific information on pile performance will be evaluated to arrive at recommended installation procedures and estimated pile capacity versus penetration.

Load Testing Equipment;

Provide details of the static load testing equipment and procedures, including the size, type, and length of reaction piles, description and

sketch of the jacking apparatus and set-up, and description of jacking safety equipment and procedures, and calibration of jacking equipment.

SD-02 Shop Drawings

Prestressed Concrete Piling; G

Contractor shall furnish to the Contracting Officer drawings including shop and erection details and details of collars, shoes, and embedded or attached lifting devices, prior to commencing the work or ordering materials. Drawings shall indicate pick-up and support points for piles. Reinforcing steel details shall conform to ACI SP-66.

SD-06 Test Reports

Static Load Test Report; G

Contractor shall furnish to the Contracting Officer a complete report on the static load test, including a plot of applied load versus displacement and all applicable information as specified in ASTM D 1143, within 7 days of completion of load test. The report shall be prepared by or under the direct supervision of a registered professional engineer experienced in pile load testing and load test analysis. Within 7 days of receipt, or within 10 days of receipt of the Dynamic Test Pile Report, whichever occurs later, the Contracting Officer will determine the required tip elevation and driving resistance required for permanent production piles. From these requirements and from indicated finish grade of structures, the Contractor shall prepare a production schedule of the number of permanent piles of each length, required tip elevation, driving resistance, and their location. This schedule shall be approved before any piles, except test piles, are ordered.

Dynamic Test Pile Report; G

The Contractor shall furnish, in accordance with paragraph FIELD TESTS AND INSPECTIONS, a complete printed report on the dynamic load tests, including, but not limited to, a description of the pile driving equipment, driving records for test piles, complete test data (including the .X01 electronic data files), analysis of test data, and recommended allowable design versus loads penetration resistance and tip elevation based on the test results. The dynamic analysis shall include assessment of hammer performance, pile stresses and integrity, and soil resistance during installation, and shall include both CAPWAP and refined Wave Equation analyses. The report shall be prepared by or under the direct supervision of the Contractor's consultant for pile testing, who shall also inspect installation of test piles and initial production piles. A minimum of 10 days from submission of the report shall be allowed for approval. The Contractor shall use the Contracting Officer's comments and the approved test report, along with the approved static load test report and comments where applicable, to prepare a schedule of production pile lengths, required tip elevations, driving resistance, and locations. The schedule shall be approved prior to ordering permanent production piles.

Concrete Mix Proportions and Tests; G

In accordance with referenced VDOT specifications, concrete mix design, proportions and test results shall be submitted and approved prior to delivery of fabricated piles to the project site. Compressive strength results shall include 28-day test results as well as results from tests

taken prior to transfer of prestressing force.

Pile Driving;

A complete and accurate record of all driven piles shall be continually maintained, and a copy shall be provided to the Contracting Officer upon request or within 5 days of completion of driving. The record shall include the pile number or identification, location, size, length, elevation of tip and top of pile, the number of blows required for each foot of penetration throughout the entire length of the pile, the number of blows per inch for the last 18 inches of penetration, and the total driving time. The record shall include the type and size of the hammer, the rate of operation, hammer stroke or pressure gauge reading, the type and dimensions of driving helmet or cap, and the cap-block and pile cushion used. Any unusual occurrence during driving of the pile shall be recorded and immediately reported to the Contracting Officer. The Contractor shall notify the Contracting Officer 10 days prior to driving of test piles and performing static load tests. After installation is accepted, the complete record shall be submitted with the test results.

SD-07 Certificates

Material Test Reports and Certificates;

Copies of material test reports shall be submitted within 24 hours after completion of tests. The testing requirements for materials incorporated in referenced documents will be waived provided the manufacturer submits certificate(s) stating that previously manufactured materials have been tested by recognized laboratories, that such materials meet testing requirements specified, and that the materials furnished for this project are of the same type, quality, manufacture, and make as that tested. Copies of the test reports need not be submitted except as specifically required by the Contracting Officer.

SAMPLE CERTIFICATE

The manufacturer hereby certifies that previously manufactured materials have been tested by recognized laboratories, that the tested material is of the same type, quality, manufacture, and formulation as that furnished for this project, and that the tested material meets all the requirements of the following specifications:

SPECIFIED MATERIAL

C-150-84
Portland Cement

TESTED MATERIAL

John Doe Company

SIGNATURE AND TITLE

1.4 QUALIFICATIONS

The work shall be performed by a firm specializing in the specified foundation system and having experience in constructing and installing the specified foundation system under similar subsurface conditions. The Contractor shall provide a Piling Quality Control Representative (PQCR) with full authority to direct the pile installation activities, and shall also provide an independent Consultant for pile testing. The PQCR shall provide full-time inspection of all pile handling and installation activities, and shall have at least 2 years experience in this field. The

Contractor's consultant for pile testing shall be a professional Civil Engineer licensed by the Commonwealth of Virginia, experienced in soil mechanics and foundations and having a minimum of two (2) years experience monitoring pile installation and testing and using the specified pile driving analyzer, and shall be fully independent of the Prime Contractor and its subcontractors.

1.5 SUBSURFACE DATA

Subsurface soil data logs are shown in Section 01055 SOIL BORING DATA. The subsurface investigation reports and samples of materials as taken from subsurface investigations are available for examination at the Norfolk District, 803 Front Street, Norfolk, Virginia.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Admixtures

Admixtures shall be used at no additional cost to the Government. All admixtures shall conform to the requirements of VDOT under Section 405 for structures over tidal waters. Air-entraining admixture shall conform to ASTM C 260. Admixtures containing chlorides shall not be used.

2.1.2 Aggregates

Aggregates shall conform to the requirements of VDOT under Section 405 for structures over tidal waters.

2.1.3 Anchorage

Anchorage and end fittings shall conform to ACI 318/318R and the requirements of VDOT for pile Anchorage.

2.1.4 Cement

Cement shall conform to the requirements of VDOT under Section 405 for structures over tidal waters. Cement shall conform to ASTM C 150 except Type IV shall not be used.

2.1.5 Grout

Grout materials used in prestressed piles shall conform to the requirements specified herein for concrete mixes. Admixtures, when required for grout, shall have no injurious effects on steel or concrete. Calcium chloride shall not be used. The grout shall conform to VDOT standards.

2.1.6 Prestressing Steel

Prestressing steel shall conform to the requirements of VDOT under Section 405 for structures over tidal waters.

2.1.7 Reinforcing Steel

Non-prestressed reinforcing steel shall conform to the requirements of VDOT under Section 405 for structures over tidal waters. Welding of reinforcing steel shall be in accordance with VDOT standards.

2.1.8 Ties and Spirals

Steel for ties and spirals shall conform to the requirements of VDOT under Section 405 for structures over tidal waters.

2.1.9 Water

Water for mixing concrete shall conform to VDOT standards.

2.2 MANUFACTURED UNITS - GENERAL REQUIREMENTS

2.2.1 Pretensioned Piles

Pretensioned piles may be solid and shall be cast as monolithic units of homogeneous high-strength concrete from head to tip and stressed with high-tensile cold-drawn low-relaxation steel strands. Design criteria shall be in accordance with VDOT standards. Manufacturing of piles shall conform as stated in Section 405 Road and Bridge Standards for piles exposed to tidal waters.

2.3 FABRICATION OF PRETENSIONED PILES

Production piles shall not be fabricated and delivered to the site until the Dynamic Test Pile Report and static Load Test Report is approved.

2.4 Workmanship

Workmanship shall conform to VDOT standards. Pile pick-up points shall be the responsibility of the Contractor. Unless special lifting devices are attached for pick-up, location of pick-up points cast in the concrete shall be plainly marked on all piles after removal of the forms, and all lifting shall be done at these points. Piles shall be lifted by a suitable bridge or sling attached to the pick-up points. Piling shall not be driven until the concrete attains a compressive strength of not less than 6000 psi as indicated by breaking test cylinders.

PART 3 EXECUTION

The Contractor shall select pile driving equipment based upon subsurface conditions, pile size and capacity, local experience and Wave Equation Analyses per paragraph 1.3 SUBMITTALS. Stresses predicted by wave equation analysis shall not exceed the effective prestress in tension, and 0.85 times the concrete compressive strength minus the effective prestress. Between 7 and 21 calendar days prior to installing test piles, the Contractor's Piling Quality Control Representative (PQCR) and the Contractor's Consultant for pile testing shall conduct a Preparatory Inspection with the Contracting Officer's Representative. The inspection shall include, but not be limited to, a review of the approved pile driving and testing equipment submittals and a discussion of the proposed installation program. Final approval of driving equipment shall be based upon driving results of test piles, as approved by the Contracting Officer, but approval shall not relieve the Contractor of the responsibility of achieving satisfactory installation of test and production piles as

specified and indicated.

3.1 PILE DRIVING EQUIPMENT

3.1.1 Pile Hammers

The hammer used shall be capable of developing the specified ultimate pile capacity prior to reaching driving refusal, and shall be capable of providing the specified ultimate capacity upon re-strike (phase two testing), and shall take into consideration hammer impact velocity; ram weight; cross section, length, and total weight of the pile; and the character of subsurface material to be encountered. The Contractor shall pay particular attention to the need for the pile hammer to be capable of driving the pile through the medium to very dense sand layer shown on the boring logs. For air or steam hammers, obtain required driving energy of hammer by use of a heavy ram and a short stroke with low impact velocity. Initial hammer selection and operating procedure shall be in accordance with Wave Equation Drivability Analyses results per paragraph 1.3 SUBMITTALS. Hammer operation shall be modified, or the hammer replaced, during test pile or production pile installation as required, in accordance with refined Wave Equation Analyses and Pile Dynamic Analyzer results or as recommended by the Contractor's Consultant for pile testing at no additional cost. Single-acting hammers shall have an indicator and scale, easily legible from the ground, for hammer stroke measurement. A gauge to monitor air or steam hammer pressure, or diesel hammer bounce chamber pressure, shall be readable by inspectors on the ground.

3.1.2 Driving Helmets and Pile Cushions

A driving helmet or cap including a pile cushion shall be used between the top of the pile and the ram to prevent impact damage to the pile. The driving helmet or cap and pile cushion combination shall be capable of protecting the head of the pile, minimize energy absorption and dissipation, and transmit hammer energy uniformly over the top of the pile. The driving helmet or cap shall fit loosely around the top of the pile so that the pile is not restrained by the driving cap if the pile tends to rotate during driving. The pile cushion may be of solid wood or of laminated construction, shall completely cover the top surface of the pile, and shall be retained by the driving helmet. The minimum thickness of the pile cushion shall be 6 inches and the thickness shall be increased so as to be suitable for the size and length of pile, character of subsurface material to be encountered, hammer characteristics, and the required driving resistance. The pile cushion shall be new at start of driving of each pile, and it shall be replaced if it has been highly compressed, charred, or burned, or has become deteriorated in any manner during driving, but shall not be changed within the last 3 feet of driving.

3.1.3 Hammer Cushion

A hammer cushion, when recommended by the hammer manufacturer, shall be used between the helmet or cap and the hammer ram. The cushion may consist of solid hardwood block with grain parallel to the pile axis and enclosed in a close fitting steel housing or may consist of aluminum and approved industrial type plastic laminate (micarta) discs stacked alternately in a steel housing. Steel plates shall be used at the top and the bottom of the hammer cushion. Where the cushion is other than that specified above, the Contractor shall submit to the Contracting Officer, at least 2 weeks before

the start of test pile driving operations, detailed drawings of the cushion he proposes to use accompanied by records of the successful use. The hammer cushion shall be replaced if it has been damaged, highly compressed, charred, or burned or has become spongy or deteriorated in any manner. If a wood cushion is used, it shall not be replaced during the final 3 feet of driving of any pile. Under no circumstances will the use of small wood blocks, wood chips, rope, or other material permitting excessive loss of hammer energy be permitted.

3.2 INSTALLATION

All pile handling and installation shall be performed under the direct supervision of the PQCR for pile installation, as specified in paragraph QUALIFICATIONS.

3.2.1 Handling and Driving

Piles or pile sections shall not be handled or moved in any manner that would result in cracking or permanent damage to the concrete or to the grout surrounding the prestressing cables. Piles shall not be driven until the concrete has attained a minimum strength of 6000 psi. Piles may be driven without pile guides or leads providing a hammer guide frame is used to keep the pile and hammer in alignment. Piles shall be lifted by pickup points shown.

3.2.2 Pile Driving

The Contracting Officer shall be notified at least 10 days prior to beginning installation of test piles. Pile driving records shall be monitored by the Contractor's Consultant for pile testing or the PQCR and prepared in accordance with paragraph SUBMITTALS. Excavation shall be stopped at 1 foot above foundation grade before piles are driven. When pile driving is completed, excavation shall be completed to lines and grade shown. Dynamic formula such as the Engineering News Record (ENR) formula shall not be used to determine the driving resistance at which pile driving will be terminated. During initial driving and until pile tip has penetrated beyond layers of very soft soil, steam and air hammers shall use a reduced driving energy of the hammer. Diesel-powered hammers shall be operated at the rate recommended by the manufacturer throughout the entire driving period. Sufficient pressure shall be maintained at the steam or air hammer so that:

- a. For a double-acting hammer, the number of blows per minute during and at the completion of driving of the pile is equal approximately to that at which the hammer is rated.
- b. For a single-acting hammer, there is a full upward stroke of the ram, unless a shortened stroke is directed by the Contractor's Consultant for Pile Testing.
- c. For a differential type hammer, there is a slight rise of the hammer base during each upward stroke.

Test piles shall be installed and tested in accordance with paragraph FIELD TESTS AND INSPECTIONS. Permanent production piles shall be driven continuously and without interruption to or below the required tip elevation. The pile hammer and driving technique (including any jetting or preaugering) used for driving permanent piles shall be the same, operated at the same rate and in the same manner, as that used for driving the test

piles, except when refined Wave Equation Analyses or Dynamic Pile Analyses indicate revisions are required as recommended by the Contractor's Consultant for pile testing. See paragraph "Dynamic Pile Analyses" for testing requirements if any changes are made to pile driving equipment or technique. Pile driving records shall be monitored daily by the Contractor's consultant for pile testing, whose recommended revisions to the procedures and equipment shall be instituted. Any pile failing to meet the driving resistance, shall be restruck as recommended by the consultant for pile testing, in the presence of the CO. If a pile refuses prior to reaching the required tip elevation or, if obstructions or unusual conditions are encountered, the Contractor shall immediately notify the Contracting Officer and perform corrective measures as directed by him. Driving refusal shall occur if the number of properly delivered hammer blows exceed 60 blows per six inches of penetration. Additional payment will not be made for corrective measures to drive through the sand layer (as noted in paragraph "Hammers") for piles which were not jetted or preaugered as specified.

3.2.3 Jetting of Piles

Jetting shall be allowed in accordance with the following requirements. The jetting equipment shall have no fewer than 2 water or combination air-water type jets. Jetting of pier and dolphin piles shall be discontinued when the pile tip is at an elevation of approximately -55 feet NGVD or at a depth as directed by the Contracting Officer. Jetting of other piles shall not be allowed. Damage to existing structures caused by jetting shall be repaired by the Contractor, at the Contractor's expense. The remaining final penetration shall be achieved by driving. Before starting the driving of the final penetration length, the pile shall be firmly seated in place by the application of a number of reduced energy hammer blows. No separate payment will be made for jetting.

3.2.4 Preaugering

All pile locations on land shall be preaugered to at least elevation -10 feet, and all other piles shall be preaugered to a depth of 10 feet below the existing mudline to identify and clear possible obstructions. Preaugering is permitted to elevation -55 feet NGVD for pier and dolphin piles. Piles located on land shall only be preaugered to elevation -10 feet NGVD. The area of the auger shall not exceed 80 percent of the pile cross-sectional area. No separate payment will be made for preaugering.

3.2.5 Cutting of Piles

When necessary and approved by the Contracting Officer in writing, cutting of piles shall be with pneumatic tools, sawing, or other approved methods which will not damage the pile below the surface of the cut. The use of explosives for cutting will not be permitted. Payment for cutting of piles required by condition beyond the control or responsibility of the Contractor will be made in accordance with paragraphs BASIS FOR BIDS AND PAYMENT.

3.2.6 Protection of Piles

Care shall be taken to avoid damage to the piles in handling piles, in placing the pile in the leads, and during the pile driving operations. Where pile or projecting reinforcement orientation is essential, special care shall be taken to maintain the orientation during driving. Special

care shall be taken in supporting battered piles to prevent excessive bending stresses in the pile. The top of the pile shall be squared to the longitudinal axis of the pile. If the Contractor elects to use a pile head with projecting strands or mild steel reinforcing, a special driving head shall be used to prevent damage to the reinforcement and prevent direct impact forces from being transmitted through the reinforcement.

3.2.7 Pile Locations and Tolerances

A pile placement plan and tolerances shall be developed to show the installation sequence and the methods proposed for controlling the location and alignment of piles and submitted for approval. Piles shall be placed accurately in the correct location and alignments, both laterally and longitudinally, and to the vertical or batter lines indicated. The Contractor shall establish a permanent baseline during pile driving operations to provide for inspection of pile placement by the Contracting Officer. The baseline shall be established prior to driving permanent piles and shall be maintained during the installation of the permanent piles. Prior to driving and with the pile head seated in the hammer, the Contractor shall check each pile for correct alignment. The alignment of battered piles shall be checked and monitored during driving with an accurate batter board level and/or surveying instrument. Piles shall not be driven with a variation of more than 1/4 inch per foot from the vertical or batter specified. Top of pile shall be within 12 inches laterally and within 2 inches vertically of the location indicated, but in all cases the clear distance between the heads of piles and edges of beams shall be at least 6 inches. All piles shall be checked for heave. Piles found to have heaved shall be redriven to the required point elevation.

3.2.8 Build-Ups

Build-ups will not be permitted.

3.2.9 Splices

Splicing of piles will not be permitted.

3.2.10 Pilot Piles

Pilot piles shall be permitted to break or cut through obstructions. Pilot piles shall not extend below elevation -60. Using the job or test pile as a spud shall not be permitted.

3.2.11 Damaged Piles

a. When the tip of a driven pile is passing through soft soil so that there is little or no resistance to penetration of the pile, longitudinal tensile stresses may be generated in the pile shaft. These tensile stresses may be sufficient to damage the pile during driving. For such driving conditions, the contractor shall modify his driving procedures to limit the tensile stresses in the piles to acceptable levels. Piles which fail due to longitudinal tensile stresses caused by inappropriate driving shall be replaced by the Contractor at no additional expense to the Government.

b. Should any pile be damaged during driving, or be driven outside its specified tolerance for position, or otherwise be rejected due to non-conformance with the requirements of the contract, it shall be abandoned and additional pile or piles shall be installed at no additional

cost, in the locations designated by Contracting Officer to replace the abandoned pile. Such changes in pile caps, strap beams, and reinforcement made necessary by such pile relocations shall be made without additional cost. Abandoned piles shall be cut off below the bottoms of the pile caps, or lower as directed by the Contracting Officer.

c. If any pile driven to the specified tip elevation is found to be out of plumb, or if its center at the level of the cut off is out of position or any pile is loaded more than 10 percent greater than its design load, or so as to change the shape of the pile group making it necessary to investigate and redesign the pile caps or other foundation concrete, the contractor shall provide additional piles as directed, or make such changes in pile caps as directed, so that no pile in the completed group will be loaded more than 10 percent greater than its designed load, computed from an assumed fully loaded condition in its designed position. The cost of additional piles and changes to concrete pile caps, etc., made for this purpose shall be borne by the contractor.

d. Work of whatever nature, including cost of investigating and redesign, required on account of rejected, damaged, or displaced piles, excepting piles which have been abandoned at the Government's expense due to obstructions as stipulated herein, shall be provided by the contractor as directed and without additional cost.

e. For efficient prosecution of the work, the licensed land surveyor engaged by the contractor shall convey partial pile survey information to the Contracting Officer at intervals, so that any necessary investigation and redesign may proceed at a reasonable time. At the conclusion of the work, however, all pile survey information shall be furnished on a drawing as described under SUBMITTALS. The Government reserves the right to take up to 10 working days to review and approve final pile locations.

3.2.12 Obstructions to Driving Piles

a. If obstructions are encountered below the bottom of the pile cap, the contractor shall remove partially driven pile or use a mandrel or a steel spud to clear a way for the pile or piles. If so ordered by the Contracting Officer in writing, and unless otherwise specified, obstructions encountered below the bottom of each pile cap shall be removed by the contractor payment therefore will be made in accordance with the Contract clauses. Because of the obstructions, under this paragraph, the Contracting Officer may abandon piles and order additional piles and the footage of such piles abandoned and additional piles shall be paid for in accordance with the CHANGES clause of the CONTRACT CLAUSES. The additional cost of pile cap, struts, or girders required because of obstructions under this paragraph will be borne by the Government. When not caused by obstructions, these costs shall be borne by the Contractor. The investigation and redesign costs shall be paid as stipulated under DAMAGED PILES.

b. If, subsequent to the driving of a completed pile, the pile is damaged by an obstruction during the driving of another pile, the Government will pay the cost of the work ordered by the Contracting Officer to correct the condition.

c. If the pile gets out of alignment by loss of contact with the driving apparatus, or if it is abandoned during the operation and thereafter constitutes an obstruction in the ground and causes damage to a pile in the same or adjacent location, the contractor shall assume all costs

attributable to the displaced part or parts.

3.3 FIELD TESTS AND INSPECTIONS

The Contractor shall notify the Contracting Officer 10 days prior to driving of test piles and load test piles, in order to witness the driving, testing, and recording procedures of the piles.

3.3.1 Test Piles

Approximately seven 120 foot long, 300 ton, test piles conforming to the requirements for permanent piles shall be driven at the locations indicated and to a tip elevation of -110 feet NGVD as follows or as otherwise directed by the Contracting Officer.

Installation of all test piles shall be observed by the Contractor's Consultant for Pile Testing, and monitored as specified herein.

For each test pile, a record shall be kept as specified in paragraph SUBMITTALS. The piles and pile driving shall conform to the requirements specified herein and, unless directed otherwise by the Contracting Officer, driving shall be continuous until the tip of the pile has been driven to the tip elevation indicated. Any or all of the additional 5 feet of test pile shall, as directed by the Contracting Officer, either be driven below design tip elevation after restrike or static loading, or cut off, as directed by the Contracting Officer, such that the permanent top of pile is located at its design elevation. Jetting shall be in accordance with paragraph "Jetting of Piles". Test piles indicated or directed to be driven in permanent locations may be incorporated into the work if they are approved by the Contracting Officer after all testing has been completed. Within 7 days of receipt of the complete dynamic test pile report and the full set of test pile driving records, the Contracting Officer will determine which test piles are to be load tested.

3.3.2 Dynamic Pile Analyses

A dynamic pile analysis shall be performed on the seven indicated test piles.

3.3.2.1 Phase One

The first phase will occur when the test piles are initially driven to check the hammer, pile, and soil performance, and to determine the suitability of the proposed hammer for the size, length and type of pile being driven for the soil types encountered as the piles are driven. This initial monitoring shall determine whether jetting or pre-augering is appropriate, efficiency of the hammer relative to specified efficiency, effectiveness of cushion, level of compressive and tensile stress in pile and extent/location of any pile damage caused by the initial driving. With each blow of the pile, the information listed below shall be electrically recorded and analyzed by the Pile Driving Analyzer:

- a. Blow number
- b. Blow rate per minute or hammer stroke for diesel hammers
- c. Input and reflected values of force and velocity

- d. Value of upward and downward traveling force wave with time
- e. Maximum and final transferred energy to pile, hammer system efficiency
- f. Maximum compressive stress, velocity, acceleration and displacement
- g. Maximum tensile stress in pile
- h. Pile structural integrity, damage detection, extent and location.
- i. Bearing capacity of pile by Case method.

If the pile, hammer, and soil performance evaluation recommends changes to the hammer size, stroke, pile cushioning, augering, jetting, or any other aspect for the pile driving operation, these changes shall be incorporated into production pile driving in an effort to control excessive stresses and pile damage. If changes are made, then Phase One dynamic analysis monitoring shall be repeated for the first four production piles and the Contractor shall not proceed with further production pile driving until the recommendations made by his Consultant for pile testing are reviewed and approved by the Contracting Officer and implemented by the Contractor. This procedure shall be repeated until allowable tensile and compressive stresses are achieved in the pile and/or pile damage is minimized. No separate payment will be made for these additional analyses.

3.3.2.2 Phase Two

Upon completion of test pile driving, the piles shall be allowed to set-up for at least 72 hours. After evaluation of pile, hammer and soil performance by the Contractor's consultant for pile testing, the second phase of the dynamic pile analysis may proceed. The second step of dynamic pile analysis is the dynamic load test. This portion of the evaluation requires striking each of the set-up piles a minimum of 20-50 times, or as directed by the Contractor's consultant, using the same hammer which was used for the test pile driving and which will be used for production pile driving. In addition to those items listed in paragraph Phase One above, selected restrike driving records, as directed by the contractor's Consultant for Pile Testing and approved by the contracting Officer, are to be subjected to rigorous computer analysis by the Case Pile Wave Analysis Program (CAPWAP) for determination of resistance distribution, soil resistances and properties, plot of applied load versus average pile displacement based on the calculated soil properties, and for establishing driving criteria for production piles.

3.3.3 Dynamic Test Pile Report

Upon satisfactory completion of all dynamic load testing, a minimum of three copies of a Dynamic Pile Test Report shall be submitted to the Contracting Officer for review and approval. The submittal shall be prepared and sealed by the Contractor's Consultant for Pile Testing and shall be made within ten (10) days of the completion of the dynamic load test. The report for the Dynamic Pile Analysis shall contain the following information:

- a. Bearing capacity of piles from Case Pile Wave Analysis Program (CAPWAP) information resulting from analysis of selected restrike blows.

- b. Maximum and final transferred energy, hammer system efficiency.
- c. Maximum compressive stress, velocity, acceleration and displacement.
- d. Maximum tensile stress in pile.
- e. Pile structural integrity, damage detection, extent and location.
- f. Blows per minute and blow number.
- g. Input and reflection values of force and velocity, upward and downward traveling force wave with time.
- h. Pile skin friction and toe resistance distribution.
- i. Maximum energy transferred to pile.
- j. Recommended tip elevations, driving refusal criteria (maximum blows per inch) and end-of-driving penetration resistances (blows per foot) and related hammer strokes/rates for production piles to achieve the specified design capacity.
- k. Recommended pile and ASTM D1143 testing procedure for static load testing.

Upon satisfactory completion of a static load test, the Contractor's Consultant for pile testing shall propose the maximum allowable pile design load for the indicated pile tip elevations, the recommended tip elevation to achieve the specified design capacity, and any recommended revisions to the proposed driving criteria provided with the Dynamic Testing Report.

3.3.4 Static Load Tests

Static load tests shall be performed on two test piles, determined by the Contracting Officer, in accordance with ASTM D 1143 and as specified herein. The load tests will be on two of the piles tested dynamically. The apparatus for applying the vertical loads shall be as given by the method either for load supported directly by the pile, or load from weighted box or platform or reaction frame attached to sufficient reaction piles to take safely the required load applied to the pile by hydraulic jack. Additional load tests, at the expense of the Government at the bid price, may be required. The contractor shall be responsible for furnishing and setting up load apparatus and load measuring equipment. The load apparatus and measuring equipment shall be of sufficient capacity to apply maximum load of not less than 350 tons. Loading, testing, and recording shall be under the supervision of the Contractor's Consultant for pile testing. Piles shall be load tested to failure estimated to be at 300 tons. This ultimate load shall be maintained for not less than 2 hours and then released in 25 percent decrements with 15 minutes between decrements. The load test report shall be submitted in accordance with paragraph SUBMITTALS.

TABLE A

PILE SURVEY & TABULATION

PROJECT LOCATION: _____
TITLE: _____ CONTRACT NO: _____
SURVEYED BY: _____ DATE: _____
REFERENCE DRAWINGS: _____

PILE GROUP NO.	PILE NO.	PERMISSIBLE DEVIATION			ACTUAL DEVIATION			OUT OF TOLERANCE		
		X	Y	Z	X	Y	Z	X	Y	Z

REMARKS

-- End of Section --

SECTION 02510

WATER DISTRIBUTION SYSTEM

04/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997a) Carbon Structural Steel
ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B 88	(1996) Seamless Copper Water Tube

ASME INTERNATIONAL (ASME)

ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B36.10M	(1996) Welded and Seamless Wrought Steel Pipe

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	(1996) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

AWWA C153	(1994; Errata Nov 1996) Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm through 610 mm) and 54 In. through 64 In. (1,400 mm through 1,600 mm) for Water Service
AWWA C200	(1997) Steel Water Pipe - 6 In. (150 mm) and Larger
AWWA C203	(1997) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C205	(1995) Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger - Shop Applied
AWWA C207	(1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
AWWA C208	(1996) Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C500	(1993; C500a) Metal-Sealed Gate Valves for Water Supply Service
AWWA C502	(1994; C502a) Dry-Barrel Fire Hydrants
AWWA C509	(1994; Addendum 1995) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(1993) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606	(1997) Grooved and Shouldered Joints

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

ACPPA Work Practices	(1988) Recommended Work Practices for A/C Pipe
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DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA-Restraint Design	(1997) Thrust Restraint Design for Ductile Iron Pipe
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves
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NSF INTERNATIONAL (NSF)

NSF 61	(1999) Drinking Water System Components - Health Effects (Sections 1-9)
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THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 21	(1991) White or Colored Silicone Alkyd Paint
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

1.2 PIPING

This section covers water supply distribution and service lines, and connections for new pier. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Service Lines

Piping for water service lines less than 3 inches in diameter shall be galvanized steel, or copper tubing, unless otherwise shown or specified. Piping for water service lines 3 inches and larger shall be ductile iron, filament-wound or centrifugally cast reinforced thermosetting resin, or steel, unless otherwise shown or specified.

1.2.2 Distribution Lines 3 Inches or Larger

Piping for water distribution lines 3 inches or larger shall be ductile iron, or centrifugally cast reinforced thermosetting resin, unless otherwise shown or specified.

1.2.3 Supply Lines 3 Inches or Larger

Piping for water supply lines 3 inches or larger shall be ductile iron, unless otherwise shown or specified.

1.2.4 Potable Water Lines

Piping and components of potable water systems which come in contact with the potable water shall conform to NSF 61.

1.3 MANUFACTURER'S REPRESENTATIVE

The Contractor shall have a manufacturer's field representative present at the jobsite during the installation and testing of pipe to provide technical assistance and to verify that the materials are being installed in accordance with the manufacturer's prescribed procedures. When the representative feels that the Contractor is installing and testing the pipe in a satisfactory manner, certification shall be written to note which individuals employed by the Contractor are capable of properly installing the pipe. The field representative shall advise the Contractor of unsatisfactory conditions immediately when they occur. Such conditions include improper diameter of pipe ends, damaged interior liner, poorly prepared joints, improper curing of joints, moving pipe before joints are cured, bending pipe to follow abrupt changes in trench contours, not properly drying joints after rain storms, exceeding effective adhesive life, sharp objects in trench bed, improper procedure for concrete encasement of pipe, omission of thrust blocks at changes in direction or any other condition which could have an adverse effect on the satisfactory completion and operation of the piping system.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation

The manufacturer's recommendations for each material or procedure to be utilized.

Waste Water Disposal Method; G

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications, and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-06 Test Reports

Bacteriological Disinfection

Test results from commercial laboratory verifying disinfection.

SD-07 Certificates

Installation

A statement signed by the manufacturer's field representative certifying that the Contractor's personnel are capable of properly installing the pipe on the project.

1.5 HANDLING

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the Government. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark

place.

1.5.1 Coated and Wrapped Steel Pipe

Coated and wrapped steel pipe shall be handled in conformance with AWWA C203.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Ductile-Iron Pipe

Ductile-iron pipe shall conform to AWWA C151, working pressure not less than 150 psi, unless otherwise shown or specified. Pipe shall be cement-mortar lined in accordance with AWWA C104. Linings shall be standard. Flanged ductile iron pipe with threaded flanges shall be in accordance with AWWA C115.

2.1.2 Steel Pipe

2.1.2.1 Pipe 3 Inches and Larger, Not Galvanized

Steel pipe, not galvanized, shall conform to AWWA C200 with dimensional requirements as given in ASME B36.10M for pipe 6 inches in diameter and larger, and ASTM A 53 for smaller sizes. Pipe shall be welded or seamless with plain or shouldered and grooved ends in accordance with AWWA C606 for use with mechanical couplings or bell-and-spigot ends with rubber gaskets. Bell-and-spigot ends for sizes less than 6 inches diameter shall be as required by AWWA C200. The minimum wall thickness of the various sizes of pipe shall be as follows:

Pipe Sizes	Thickness
2"	.25
4"	.29
6"	.31
8"	.33

2.1.2.2 Galvanized Steel Pipe

Galvanized steel pipe shall conform to ASTM A 53, standard weight.

2.1.2.3 Protective Materials for Steel Pipe

Protective materials for steel pipe, except as otherwise specified, shall be mechanically applied in a factory or plant especially equipped for the purpose. The materials shall, unless otherwise indicated on the drawings, consist of the following for the indicated pipe material and size:

- a. Pipe and fittings less than 3 inches in diameter shall be thoroughly cleaned of foreign material by wire brushing and solvent cleaning, and then given 1 coat of coal-tar primer and 2 coats of coal-tar enamel conforming to AWWA C203; threaded ends of pipe and fittings shall be adequately protected prior to coating.
- b. Pipe 3 Inches or Larger, Not Galvanized:

(1) Cement-mortar coating and lining shall conform to and shall be applied in conformance with AWWA C205. Cement-mortar coating and linings shall not be used for pipe less than 4 inches in diameter.

(2) Coal-tar enamel lining, coating and wrapping shall conform to AWWA C203 for materials, method of application, tests and handling. Non-asbestos material shall be used for the outerwrap.

(3) Cement-mortar lining, in lieu of coal-tar enamel lining, may be used with coal-tar enamel coating and wrapping. Cement-mortar lining shall conform to and shall be applied in conformance with AWWA C205.

2.1.3 Copper Tubing

Copper tubing shall conform to ASTM B 88, Type K, annealed.

2.2 FITTINGS AND SPECIALS

2.2.1 Ductile-Iron Pipe System

Fittings and specials shall be suitable for 150 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to AWWA C110. Fittings and specials for use with push-on joint pipe shall conform to AWWA C110 and AWWA C111. Fittings and specials for grooved and shouldered end pipe shall conform to AWWA C606. Fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Ductile iron compact fittings shall conform to AWWA C153.

2.2.2 Steel Pipe System

2.2.2.1 Not Galvanized Steel Pipe

Fittings and specials shall be made of the same material as the pipe. Specials and fittings may be made of standard steel tube turns or segmentally welded sections, with ends to accommodate the type of couplings or joints specified for the pipe. Dimensions of steel pipe fittings shall be in accordance with AWWA C208. The thickness and pressure rating of pipe fittings and specials shall be not less than the thickness specified and the pressure rating calculated for the pipe with which they are used. Protective materials for fittings and specials shall be as specified for the pipe. Specials and fittings that cannot be mechanically lined, coated, and wrapped shall be lined, coated, and wrapped by hand, using the same material used for the pipe with the same number of applications of each material, smoothly applied.

2.2.2.2 Galvanized Steel Piping

Steel fittings shall be galvanized. Screwed fittings shall conform to ASME B16.3. Flanged fittings shall conform to AWWA C207.

2.2.2.3 Dielectric Fittings

Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.

2.2.3 Copper Tubing System

Fittings and specials shall be flared and conform to ASME B16.26.

2.3 JOINTS

2.3.1 Ductile-Iron Pipe Jointing

- a. Mechanical joints shall be of the stuffing box type and shall conform to AWWA C111.
- b. Push-on joints shall conform to AWWA C111.
- c. Rubber gaskets and lubricants shall conform to the applicable requirements of AWWA C111.

2.3.2 Steel Pipe Jointing

2.3.2.1 Steel Pipe, Not Galvanized

- a. Mechanical couplings shall be as specified.
- b. Bell-and-spigot joints for use with rubber gaskets shall conform to AWWA C200, as appropriate for the type of pipe. Rubber gaskets shall conform to applicable requirements of AWWA C200.
- c. Flanges shall conform to AWWA C207, and shall be used only in above ground installation or where shown on the drawings, or when approved.

2.3.2.2 Mechanical Couplings

Mechanical couplings for steel pipe shall be the sleeve type, or when approved, the split-sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight setting or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.

2.3.3 Bonded Joints

Where indicated for all ferrous pipe, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

2.3.4 Isolation Joints

Isolation joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Isolation joints shall consist of a sandwich-type flange isolation gasket of the dielectric type, isolation washers, and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

- a. Sleeve-type couplings shall be used for joining plain end pipe sections. The two couplings shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.
- b. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

2.3.5 Copper Tubing Jointing

Joints shall be compression-pattern flared and shall be made with the specified fittings.

2.4 VALVES

2.4.1 Check Valves

Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Valves shall open to permit flow when inlet pressure is greater than the discharge pressure, and shall close tightly to prevent return flow when discharge pressure exceeds inlet pressure. The size of the valve, working pressure, manufacturer's name, initials, or trademark shall be cast on the body of each valve. Valves 2 inches and larger shall be 1 type.

- a. Valves 2 inches and smaller shall be all bronze designed for screwed fittings, and shall conform to MSS SP-80, Class 150, Types 3 and 4 as suitable for the application.
- b. Valves larger than 2 inches shall be iron body, bronze mounted, shall have flanged ends, and shall be the non-slam type. Flanges shall be the Class 125 type conforming to ASME B16.1.

2.4.2 Gate Valves

Gate valves shall be designed for a working pressure of not less than 150 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

- a. Valves smaller than 3 inches shall be all bronze and shall conform to MSS SP-80, Type 1, Class 150.
- b. Valves 3 inches and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.
- c. Resilient-Seated Gate Valves: For valves 3 to 12 inches in size, resilient-seated gate valves shall conform to AWWA C509.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may

be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 VALVE PITS

Valve pits shall be constructed at locations indicated or as required above and in accordance with the details shown. Concrete strength shall be in accordance with Section 03301 CONCRETE.

2.7 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA C502 with valve opening at least 5 inches in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 8 inches above the ground grade. Hydrants shall have a 6 inch bell connection, two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with 1 coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and 2 finish coats of silicone alkyd paint conforming to SSPC Paint 21. Suitable bronze adapter for each outlet, with caps, shall be furnished.

2.8 MISCELLANEOUS ITEMS

2.8.1 Service Stops

Service stops shall be water-works inverted-ground-key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service pipe used. All parts shall be of bronze with female iron-pipe-size connections or compression-pattern flared tube couplings, and shall be designed for a hydrostatic test pressure not less than 200 psi.

2.8.2 Tapping Sleeves

Tapping sleeves of the sizes indicated for connection to existing main shall be the cast gray, ductile, or malleable iron, split-sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve. Construction shall be suitable for a maximum working pressure of 150 psi. Bolts shall have square heads and hexagonal nuts. Longitudinal gaskets and mechanical joints with gaskets shall be as recommended by the manufacturer of the sleeve. When using grooved mechanical tee, it shall consist of an upper housing with full locating collar for rigid positioning which engages a machine-cut hole in pipe, encasing an elastomeric gasket which conforms to the pipe outside diameter around the hole and a lower housing with positioning lugs, secured together during assembly by nuts and bolts as specified, pretorqued to 50 foot-pound.

2.8.3 Service Boxes

Service boxes shall be cast iron or concrete and shall be extension service boxes of the length required for the depth of the line, with either screw or slide-type adjustment. The boxes shall have housings of sufficient size to completely cover the service stop or valve and shall be complete with identifying covers.

2.8.4 Disinfection

Chlorinating materials shall conform to the following:

Chlorine, Liquid: AWWA B301.

Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Casing Pipe

Water pipe shall be encased in a sleeve of rigid conduit for the lengths shown. Where sleeves are required, in all other cases, the pipe sleeve shall be steel, manufactured in accordance with AWWA C200, ASTM A 36/A 36M, with a minimum wall thickness of .5. A minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided. Sand bedding or suitable pipe support shall be provided for the water pipe through the sleeve.

Text

3.1.3 Joint Deflection

3.1.3.1 Allowable for Ductile-Iron Pipe

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

3.1.3.2 Allowable for Steel Pipe

For pipe with bell-and-spigot rubber-gasket joints, maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets shall be 5 degrees unless a lesser amount is recommended by the manufacturer. Short-radius curves and closures shall be formed by short lengths of pipe or fabricated specials specified.

3.1.4 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe coating shall be avoided. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown. Contractor shall follow manufacturer's procedure to place pipe on cast stone/roll or pipe hanger.

3.1.4.1 Piping Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA Work Practices.

3.1.4.2 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.4.3 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.5 Ductile-Iron Pipe Requirements

Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines or AWWA C606 for grooved and shouldered pipe above ground or in pits.

3.1.5.1 Not Galvanized Steel Pipe Requirements

- a. Mechanical Couplings: Mechanical couplings shall be installed in accordance with the recommendations of the couplings manufacturer.
- b. Rubber Gaskets: Rubber gaskets shall be handled, lubricated where necessary, and installed in accordance with the pipe manufacturer's recommendations.

3.1.5.2 Galvanized Steel Pipe Requirements

Screw joints shall be made tight with a stiff mixture of graphite and oil,

inert filler and oil, or with an approved graphite compound, applied with a brush to the male threads only. Compounds shall not contain lead.

3.1.5.3 Copper Tubing Requirements

Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

3.1.5.4 Bonded Joints Requirements

Bonded joints shall be installed in accordance with details specified for joints in paragraph JOINTS.

3.1.5.5 Isolation Joints and Dielectric Fittings

Isolation joints and dielectric fittings shall be installed in accordance with details specified in paragraph JOINTS. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 1/8 inch thickness of coal tar over all fitting surfaces.

3.1.5.6 Transition Fittings

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.1.6 Service Lines 2 Inches and Smaller

Service lines 2 inches and smaller shall be connected to the main by a directly-tapped corporation stop or by a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Maximum sizes for directly-tapped corporation stops and for outlets with service clamps shall be as in TABLE I. Where 2 or more gooseneck connections to the main are required for an individual service, such connections shall be made with standard branch connections. The total clear area of the branches shall be at least equal to the clear area of the service which they are to supply.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLET

Pipe Size Inches	Corporation Stops, Inches For Ductile-Iron Pipe	Outlets w/Service Clamps, Inches Single & Double Strap
4	1	1
8	1-1/2	2

NOTE:

- a. Service lines 2 inches in size shall have a gate valve.

3.1.7 Field Coating and Lining of Pipe

3.1.7.1 Steel Pipe (3 In.) and Larger, Not Galvanized

- a. Cement-mortar coating and lining: Field jointing shall conform to Appendix, AWWA C205. Any defective area found in the coating and/or lining of pipe and joints shall be removed to the pipe wall and repaired. The repaired areas shall be at least equal in thickness to the minimum coating and/or lining required for the pipe. Steel reinforcement in the coating shall be repaired or replaced as necessary to assure a complete and soundly reinforced coating.
- b. Coal-tar enamel coating, lining and wrapping: Field jointing shall conform to AWWA C203. The applied materials shall be tested by means of a spark-type electrical inspection device in accordance with the requirements of AWWA C203. Any flaws or holidays found in the coating and/or lining of pipe and joints shall be repaired by patching or other approved means. The repaired areas shall be at least equal in thickness to the minimum coating and/or lining required for the pipe.

3.1.7.2 Galvanized Steel Pipe, Field Coating

Field joints shall be given 1 coat of coal-tar primer and 2 coats of coal-tar enamel conforming to AWWA C203. The tests of the coating shall conform to AWWA C203, and any flaws or holidays found in the coating of pipe and joints shall be repaired by patching or other approved means; the repaired areas shall be at least equal in thickness to the minimum coating required for the pipe.

3.1.8 Setting of Fire Hydrants, Valves and Valve Boxes

3.1.8.1 Location of Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6 inch branch line. Fire hydrants shall be protected by two bollards on front.

3.1.8.2 Location of Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown.

3.1.9 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.10 Thrust Restraint

Plugs, caps, tees and bends deflecting 11.25 degrees or more, either vertically or horizontally, on waterlines 4 inches in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent

movement. Thrust restraints shall be by restrained joints.

3.1.10.1 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA-Restraint Design.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the utility trench leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 200 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open utility trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

- a. Compliance would require maintaining barricades and walkways around and across an open utility trench in a heavily used area that would require continuous surveillance to assure safe conditions.
- b. Maintaining the trench in an open condition would delay completion of the project.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 200 psi pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 200 psi. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section, necessary to maintain pressure within 5 psi of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Piping installation will not be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$L = 0.0001351ND(P \text{ raised to } 0.5 \text{ power})$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be as specified. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently.
- b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 BACTERIAL DISINFECTION

3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as specified. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MISCELLANEOUS ITEMS. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each

fire hydrant on the line shall be opened and closed several times. From several points in the unit, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with state approved methods. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-- End of Section --

SECTION 02531

SANITARY SEWERS

04/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 74	(1998) Cast Iron Soil Pipe and Fittings
ASTM A 123/A 123M	(2000) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM C 33	(1999a) Concrete Aggregates
ASTM C 94/C 94M	(2000) Ready-Mixed Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 270	(2000) Mortar for Unit Masonry
ASTM C 564	(1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 828	(1998) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C 924	(1998) Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 972	(2000) Compression-Recovery of Tape Sealant
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 624	(2000) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 2997	(1999) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	(1999) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 49	(1994) Hazardous Chemicals Data
NFPA 325-1	(1994) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1996) Identification of the Fire Hazards of Materials for Emergency Response

1.2 GENERAL REQUIREMENTS

The Contractor shall replace damaged material and redo unacceptable work at no additional cost to the Government. All pipes shall be laid or hanged from top of trench as shown on drawings. All metal pipes shall have mechanical joints. Contractor shall perform leakage test and approved by contracting officer before final acceptance of work.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Certificates

Portland Cement

Certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes.

Joints

Certificates of compliance stating that the fittings or gaskets used for waste drains or lines designated on the plans as are oil resistant.

PART 2 PRODUCTS

1.4 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

1.4.1 Centrifugally Cast RTRP-II

RTRP-II shall conform to ASTM D 2997. Pipe shall have an outside diameter equal to standard weight steel pipe.

1.4.2 Ductile Iron Pipe

Pipe shall conform to AWWA C151 unless otherwise shown or specified.

1.4.3 Cast Iron Soil Pipe

Cast iron soil pipe shall conform to ASTM A 74, Class SV, except where Class XH is indicated. Lines indicated as acid resistant shall be Class XH and contain not less than 12 percent silicon.

1.5 REQUIREMENTS FOR FITTINGS

Fittings shall be compatible with the pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and other requirements specified below.

1.5.1 Fittings for Ductile Iron Pipe

Mechanical fittings shall conform to AWWA C110, rated for 150 psi. Push-on fittings shall conform to AWWA C110 and AWWA C111, rated for 150 psi.

2.2.6 Fittings for Cast Iron Soil Pipe

ASTM A 74.

1.6 JOINTS

Joints installation shall comply with the manufacturer's instructions. Fittings and gaskets utilized for waste drains or industrial waste lines shall be certified by the manufacturer as oil resistant.

1.6.1 Ductile Iron Pipe Jointing

Push-on joints shall conform to AWWA C111. Mechanical joints shall conform to AWWA C111 as modified by AWWA C151. Flanged joints shall conform to AWWA C115.

1.6.2 Cast Iron Soil Pipe Jointing

Rubber gaskets for compression joints shall conform to ASTM C 564. Packing material for caulked joints shall be twisted jute or oakum, tarred type, or asphalt-saturated cellulose-fiber. Joints for acid resisting cast iron soil pipe shall be made with acid resistant non-asbestos packing. The packing shall not contain material which would affect adhesion of the joint sealing material to the pipe. Lead shall be suitable for caulking of joints.

1.7 FRAMES AND COVERS

Frames and covers shall be cast iron, ductile iron. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 400 pounds. The word "Sewer" shall be stamped or cast into covers so that it is plainly visible.

1.8 STEEL LADDER

The ladder shall not be less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123/A 123M.

1.9 CEMENT MORTAR

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

1.9.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type V for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking. Air-entraining admixture conforming to ASTM C 260 shall be used with Type V cement. Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C 33, a cement containing less than 0.60 percent alkalies shall be used.

1.9.2 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C 94/C 94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.8 STRUCTURES

1.10 Sleeve

Water pipe shall be encased in a sleeve of rigid conduit for the lengths shown. A minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided. Sleeves of ferrous material shall be provided with the corrosion protection as required for the conditions encountered at the site of installation.

1.11 Pipe Laying

- a. Pipe shall be protected during handling against impact shocks and free fall; the pipe interior shall be free of extraneous material.
- b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials. Contractor shall follow the requirements of manufacturer to place pipe on cast iron chair/ roll

or pipe hanger.

- c. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted to obtain the degree of water tightness required.

1.11.1 Caulked Joints

The packing material shall be well packed into the annular space to prevent the entrance of lead into the pipe. The remainder of the space shall be filled with molten lead that is hot enough to show a rapid change in color when stirred. Scum shall be removed before pouring. The lead shall be caulked to form a tight joint without overstraining the bell and shall have a minimum depth of 1 inch after caulking.

1.11.2 Jointing

Joints between different pipe materials shall be made as specified, using approved jointing materials.

1.11.3 Handling and Storage

Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations.

1.12 Leakage Tests

Lines shall be tested for leakage by low pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low pressure air testing for vitrified clay pipes shall be as prescribed in ASTM C 828. Low pressure air testing for concrete pipes shall be as prescribed in ASTM C 828. Low pressure air testing for PVC pipe shall be as prescribed in UBPPA UNI-B-6. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C 828 and ASTM C 924, after consultation with the pipe manufacturer. Prior to infiltration or exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 25 gal per inch diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

1.13 Test for Deflection

When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after the completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 92.5 percent of the inside diameter of the pipe, but 95 percent for RPMP and RTRP. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 psi or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be spaced so that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 7.5 percent of the normal diameter of the pipe, or 5 percent for RTRP and RPMP, shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

1.14 CONCRETE CRADLE AND ENCASEMENT

The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

1.15 Steel Ladder Anchorage

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet apart vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

1.16 Jointing, Plastering and Sealing

Mortar joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of the manhole. Mortar and mastic joints between precast rings shall be full-bedded in jointing compound and shall be smoothed to a uniform surface on both the interior and exterior of the manhole. Installation of rubber gasket joints between precast rings shall be in accordance with the recommendations of the manufacturer. Precast rings may also be sealed by the use of extruded rolls of rubber with mastic adhesive on one side.

1.17 Setting of Frames and Covers

Unless otherwise indicated, tops of frames and covers shall be set flush with finished grade in paved areas or 2 inches higher than finished grade in unpaved areas. Frame and cover assemblies shall be sealed to manhole sections using external preformed rubber joint seals that meet the requirements of ASTM D 412 and ASTM D 624, or other methods specified in paragraph Jointing, Plastering and Sealing, unless otherwise specified.

1.18 External Preformed Rubber Joint Seals

External preformed rubber joint seals and extruded rolls of rubber with mastic adhesive shall meet the requirements of ASTM D 412 and ASTM C 972 to ensure conformance with paragraph Leakage Tests. The seal shall be multi-section with neoprene rubber top section and all lower sections made of Ethylene Propylene Di Monomer (EPDM) rubber with a minimum thickness of 60 mils. Each unit shall consist of a top and a bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. One unit shall seal a casting and up to six, 2 inch adjusting rings. The bottom section shall be 12 inches in height. A 6 inch high top section will cover up to two, 2 inch adjusting rings. A 12 inch high bottom section will cover up to six, 2 inch adjusting rings. Extension sections shall cover up to two more adjusting rings. Each extension shall overlap the bottom section by 2 inches and shall be overlapped by the top section by 2 inches.

-- End of Section --

SECTION 02881

DREDGING
08/01

PART 1 GENERAL

1.1 PLANT

Plant and equipment employed on the dredging work shall be in satisfactory operating condition, capable of safely and efficiently performing the work as indicated or specified, and shall be subject to inspection and approval by the Government at all times. Equipment and machinery, including pipelines and supporting plant utilized in the work at the upland placement site, shall be subject to inspection and approval by the Government and kept in good condition at all times. A complete listing of all dredging plant and machinery to be used in the work, including dredge buckets and associated equipment, skiffs, barges and scows and associated pumpout and pipeline equipment, and all other related equipment to be employed in the work, shall be submitted. The listing shall include year and manufacturer, operational capacities, safety features, operating and licensing requirements for operators, authorized operators, and a description where and how the item of equipment or plant will be employed in the work. Any leaks or deficiencies shall be promptly and properly repaired. No reduction in the capacity of the plant, once inspected and approved by the Government to be sufficient for employment on the work, shall be made except by written permission of the Contracting Officer. The measure of the "capacity of Plant" shall be its actual performance on the work to which these specifications apply. All floating plant and pipelines used as accessways or working platforms shall be equipped with walkways and guardrails conforming to Corps of Engineers Manual EM 385-1-1 and meet OSHA requirements for worker safety. All buoyant (plastic) dredge pipelines that are used on this contract shall be weighted or anchored securely to the bottom so that the pipeline will stay on the bottom, and marked with floats or buoys during daylight and amber lights during darkness to mark distinctly the entire length and course of the line.

1.2 CHARACTER OF MATERIALS

The material to be removed from within the limits indicated on the contract drawings is primarily the shoaling that has occurred since the Channel area next to the pier was last dredged; however, the Contractor should anticipate encountering some new work dredging. In addition, the Contractor may encounter trash and debris within the areas to be dredged, including but not limited to concrete rubble, scrap metal, wire rope, tires and timber pilings. The Contractor shall remove all materials in the designated dredging areas to a required depth of 20 feet below MLLW (NOS) with two feet of allowable overdepth. Bidders are expected to examine the site of work and decide for themselves the character and state of the materials. The Contractor shall be fully responsible for his evaluation of character and state of the materials and his selection of equipment necessary to complete the construction of work specified. Local minor variations in the subsurface materials are to be expected and if encountered will not be considered as being materially different within the purview of Contract Clause "Differing Site Conditions".

1.2.1 Unsatisfactory Materials for Disposal in Upland Placement Area

Soils obtained from dredging operations are classified as satisfactory and all all trash and debris encountered in the dredging areas are classified as unsatisfactory for disposal in the designated Government-furnished upland placement area. Soils shall be separated from all trash and debris that is encountered during the dredging operations. At the Contractor's option, this can be accomplished by screening as dredged material is placed in barges and scows or when the soils dredged are being pumped into the upland placement area. All trash and debris encountered during dredging operations shall be disposed in offsite landfills authorized to receive the respective material. All costs for separating trash and debris from soils, and the subsequent costs for hauling and disposal in authorized landfills shall be the responsibility of the Contractor. The Government does not warrant the accuracy of the records of previous dredging. Local minor variations in the subsurface materials are to be expected and, if encountered, will not be considered as being materially different within the purview of Contract Clause "DIFFERING SITE CONDITIONS".

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures":

SD-01 Preconstruction Submittals

Dredging and Dredged Material Placement Plan; G

Prior to commencement of dredging, submit a plan for sequence of dredging, dredging methods and plant utilized, pipeline location and material placement requirements, protection of structures, equipment, and land features.

Dredging Intent Notification; G

Prior to commencement of dredging, submit a copy of intention to start dredging notification at same time sent to Department of Environmental Quality.

Completion of Dredging Report; G

Upon completion of dredging, submit a copy of completed Report of Dredging at same time sent to Department of Environmental Quality.

Notice to Mariners; G

Submit a copy of Notice to Mariners at same time sent to Fifth Coast Guard District.

SD-02 Shop Drawings

Soundings of Dredging Area; G

Submit drawings of after dredging surveys completed and stamped by a licensed Surveyor or Engineer in the Commonwealth of Virginia verifying the required contract depth has been met throughout the entire dredging area.

SD-07 Certificates

Equipment and Machinery Operator Authorization

The Contractor shall submit a list of designated personnel qualified and authorized to operate machinery and equipment. The list shall be maintained at the job site in a current status at all times.

1.4 SPECIAL WORK REQUIREMENTS FOR DREDGING

All dredging, transport and placement of dredged material under this contract shall be in compliance with all laws and regulations governing the work. The Contractor is advised that any deviations from the construction methods and procedures indicated by the plans and specifications that are not prior approved in writing by the Contracting Officer, and any non-compliance with laws and regulations governing the work, shall be cause for the Contracting Officer issuing a stop work order. Any stop work orders issued for these causes will not be subject to time extensions or cost recovery by the Contractor. Any non-compliance with or violation of the conditions stated herein may result in criminal and civil penalties against the Contractor. The Contractor is informed that due to environmental concerns and time-of-year restrictions for dredging and dredged material disposal operations in the project area, dredging shall not be performed from the period 15 March 2002 through 30 July 2002.

1.4.1 Security and Public Safety of Work Areas

The dredging and placement areas are accessible to the general public; however, the Government will not undertake to exclude the public or restrict public access to the site during the work. The Contractor shall fully comply with the provisions of OSHA safe working practices and the Safety and Accident Prevention requirements of these specifications. The Contractor shall employ the use of signs, barricades, barriers, flagmen, and any other devices and measures required to assure public and worker safety at the dredging and placement areas at all times. All lighting associated with the project shall be limited to the immediate area of active construction only. Such lighting shall be shielded, low-pressure sodium vapor lights directed to the maximum extent practical away from populated areas and to avoid excessive illumination of the water.

1.4.2 Noise Control and Abatement

The Contractor shall employ the use of properly installed and maintained mufflers, silencers, and manufacturer's recommended sound suppressors on all plant, machinery, and equipment used on this work. The use of sound signals such as whistles, horns, or bells shall not be used if two-way radio communication can accomplish the required function. The Contractor shall not use sound signals, with the exception of those signals required for vessel operations by the U.S. Coast Guard, during the time between sunset and sunrise.

1.5 NOTIFICATIONS OF INTENT TO DREDGE AND REPORTS OF DREDGING

A notification giving the date and location the Contractor intends to start dredging at each respective dredging area for this contract shall be prepared and sent to the Virginia Department of Environmental Quality as specified. Additionally, upon completion of dredging at each respective dredging area, the Contractor shall prepare a Report of Dredging giving all data as indicated and sent to the Virginia Department of Environmental Quality as specified. When the Contractor sends a Notification or Report to

the Virginia Department of Environmental Quality, a copy shall at the same time be furnished to the Contracting Officer. The Contractor shall include the Virginia Water Protection (VWP) Permit Number on all Notifications and Reports.

1.5.1 Notification of Dredging to the Virginia Department of Environmental Quality

The Contractor shall notify the Virginia Department of Environmental Quality, attention Bert Parolari, 5636 Southern Boulevard, Virginia Beach, Virginia 23462, in writing, at least 15 calendar days prior to commencement of dredging operations at each respective dredging area for this contract. The Contractor shall include the Virginia Water Protection (VWP) Permit Number on all correspondence and reports sent to the Department of Environmental Quality.

1.5.2 Report of Dredging to the Department of Environmental Quality

The Contractor shall notify the Virginia Department of Environmental Quality, attention Bert Parolari, 5636 Southern Boulevard, Virginia Beach, Virginia 23462, in writing, within 30 calendar days of completion of dredging operations at each respective dredging area for this contract. The Contractor shall include in the Report the following information to the Virginia Department of Environmental Quality:

- (a) Date on which dredging operations started.
- (b) Date on which dredging operations were completed.
- (c) Amount of material dredged (in cubic yards).

1.6 NOTIFICATION OF COAST GUARD

Prior to commencement of work on this contract, the Contractor shall notify the Commander, Fifth Coast Guard District of his intended operations to dredge and request that it be published in the Local Notice to Mariners. This notification must be given in sufficient time so that it appears in the Notice to Mariners at least 5 work days prior to the commencement of this contract. The Contractor shall at the same time send a copy of the notification to the Contracting Officer.

1.6.1 Local Notice To Mariners

The Local Notice To Mariners (LNM) for the Fifth Coast Guard District is available by phone at (757) 398-6367, on the Internet at: <http://www.navcen.uscg.mil/lnm/d5/default.htm>, and e-mail address: ntm/d5oan@internet.uscg.mil. The LNM is the primary means for disseminating information concerning aids to navigation, hazards to navigation, and other items of marine information of interest to mariners on the waters of the United States, its territories, and possessions. These notices are essential to all navigators for the purpose of keeping their charts, light lists, Coast Pilots and other nautical publications up-to-date. These notices are published weekly. They may be obtained free of charge, by making application to the Fifth Coast Guard District, Federal Building, 431 Crawford Street, Portsmouth, Virginia 23704. If the Contractor encounters any objects on the channel bottom during dredging operations or transport of his plant that could be a hazard to navigation, he shall notify the Coast Guard immediately as to location and at the same time notify the Contracting Officer.

1.7 PHYSICAL DATA FOR DREDGING AREAS

The physical conditions indicated on the drawings and in the specifications are the result of site investigations and surveys. Information and data furnished or referred to below is furnished for the Contractor's information; however, it shall be expressly understood that the Government will not be responsible for any interpretation or conclusion drawn from this information or data by the Contractor.

1.7.1 Weather Conditions Information

Complete weather forecasts, records and reports may be obtained from the National Weather Service in Wakefield, Virginia, telephone (757) 899-4200, Menu selection service or operator assisted as applicable. The Contractor shall satisfy himself as to the hazards likely to arise from the weather conditions during the dredging period.

1.7.2 Weather/Physical Conditions

The locations of the Dredging and Placement Areas are relatively sheltered from storms; however, severe winds may cause suspension of work for short periods. Tidal currents at any of these work areas are not of sufficient velocity to interfere with dredging operations.

1.7.3 Condition of Dredging Area

The plans for dredging show the condition and location of the dredging areas. There are not any known cables, pipes, bridges, or tunnels that cross the areas to be dredged; however, the dredging area is located on the Fort Eustis Military Reservation and Army vessels utilize the structures, piers, docks, and mooring piles in proximity to the dredging area. The vessels, piers, docks, mooring piles, and similar items that are in the areas adjacent to the dredging area are off-limits to the Contractor and shall not be traversed or utilized in any way without the expressed written approval of the Contracting Officer. The Contractor shall exercise due care in all dredging and attendant plant operations to prevent damage to structures, piers, docks, mooring piles, vessels, and any other items to remain in the work area during dredging operations.

1.7.4 Obstruction of Channel

The Government will not undertake to keep the area of channels free from vessels or other obstructions, except to the extent of such regulations, if any, as may be prescribed by the Secretary of the Army, in accordance with the provisions of Section 7 of the River and Harbor Act, approved 3 August 1917. The Contractor will be required to conduct the work in such manner as to obstruct navigation as little as possible, and in case the Contractors' plant so obstructs the channel as to make difficult or endanger the passage of vessels, said plant shall be promptly moved on the approach of any vessel to such an extent as may be necessary to afford a practicable passage. Upon the completion of the work, the Contractor shall promptly remove his plant, including ranges, buoys, piles, and other marks placed by him under this contract in navigable water or on shore.

1.7.5 Contractor Responsibility

The Contractor shall hold and save harmless the United States, its officers, and employees from all claims that may arise as a result of the

Contractor's negligence in connection with the work performed under the contract, from noncompliance by the Contractor with the provisions of the contract drawings and specifications, or from the instruction of the Contracting Officer.

1.7.6 Marsh, Wetlands, and Submerged Aquatic Vegetation

Marsh areas, tidal and non-tidal wetlands, and submerged aquatic vegetation exists within the vicinity of work. In order to avoid damage to these areas, the Contractor shall not allow personnel or the operation of plant and attendant vessels, including placement or traversing of pipelines across them, except as approved by the Contracting Officer. To the maximum extent practical, the Contractor's work operations over and in the vicinity of these areas when allowed shall be at high tide.

1.7.7 Navigation Aids

The Contractor shall not relocate or move any aids to navigation that has been established by the U.S. Coast Guard. If it becomes necessary to have any aid to navigation moved in order to complete dredging operations under this contract, the Contractor shall notify the U.S. Coast Guard in writing at the address above with a copy to the Contracting Officer not less than 15 calendar days prior to such need for movement. The Contractor shall notify the U.S. Coast Guard of the approximate time the navigation aid may be relocated to its original position. All notifications to the U.S. Coast Guard shall at the same time be provided to the Contracting Officer and recorded in the Daily Report of Operations. In the event that the Contractor disturbs or damages any navigation aid during work operations, which includes during mobilization or demobilization of his plant, the Contractor shall immediately stop the activity which disturbed or damaged the navigation aid, take immediate corrective action to prevent further disturbances or damage, and shall notify the Coast Guard immediately as to location, and at the same time notify the Contracting Officer.

1.7.7.1 Use of Coast Guard Navigation Aid Structures

The Commander, Fifth Coast Guard District, has authorized the Norfolk District, Corps of Engineers, and its Contractors to use fixed Federal aids to navigation structures, established and maintained by the U. S. Coast Guard, for support of temporary dredging tide gauges when performing Federal dredging operations. If a Contractor chooses to use navigation aid structures for this purpose, he shall abide by the following requirements:

a. The Contractor shall advise the Commander, Fifth Coast Guard District, Aids to Navigation Branch, Federal Building, 431 Crawford Street, Portsmouth, Virginia 23704, in writing, of his intention to attach tide gauges to navigation aid and structures, prior to commencing a dredging project. This notice shall include the name of each aid to navigation to which tide gauges are to be attached, and the anticipated dates the gauges will be attached and removed. A copy of this notice shall be furnished at this time to the Contracting Officer.

b. The Contractor shall be required to remove any temporary tide gauges immediately upon completion of dredging operations and demobilization of dredging plant. The Contractor shall at his expense repair or replace any aids that he has damaged or destroyed as a result of the Contractor's use of such aids.

c. This provision refers only to Federal aids to navigation structures and

does not authorize the Contractor to utilize aids that are not established and maintained by the U. S. Coast Guard. This provision also does not authorize the Contractor to utilize Federal navigation aid structures for any purposes other than the support of temporary tide gauges.

1.7.8 Hours of Work

The Contractor will be allowed to perform dredging work from 0700 to 1700, Monday through Friday, for the entire performance period, unless approved otherwise by the Contracting Officer. Precautions for any night work shall be coordinated with the Job Hazard Analysis. Adequate lighting in compliance with all OSHA Regulations and Coast Guard Regulations for thorough inspection of night operations and public safety shall be provided by the Contractor at his expense.

1.8 INSPECTION FOR DREDGING

The presence of the construction representative shall not relieve the Contractor of responsibility for the proper execution of the work in accordance with the specifications. The Contractor will be required:

a. To furnish, on the request of the Contracting Officer or any construction representative, the use of such boats, boatmen, laborers, and material forming a part of the ordinary and usual equipment and crew of the dredging plant as may be reasonably necessary in inspecting and supervising the dredging or placement area work areas.

b. To furnish, on the request of the Contracting Officer or any construction representative, suitable transportation from all points within the dredging and placement area, to and from the various pieces of plant and the staging areas, and as may be reasonably necessary in inspecting and supervising the work. Should the Contractor refuse, neglect, or delay compliance with these requirements, the specific facilities may be furnished and maintained by the Contracting Officer, and any resultant cost incurred by the government will be deducted from any amounts due or to become due the Contractor.

1.9 SAFETY AND ACCIDENT PREVENTION FOR DREDGING

The Contractor shall not commence work at a job site prior to the Government's review of an acceptable Contractor accident prevention plan per the US Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1) and discussion of the accident prevention plan at a prework meeting.

1.9.1 Conflicts

The Contractor shall comply with Occupational Safety and Health Act (OSHA) Standards, Coast Guard, as well as the Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1). When a conflict exists between Corps of Engineers Safety and Health Requirements Manual, nationally recognized consensus standards, or the contract plans and specifications, the most stringent requirements as determined by the Contracting Officer will govern.

1.9.2 Activity Hazard Analysis

Corps of Engineers' Manual EM 385-1-1, 1996 edition, is hereby supplemented or revised as follows:

Based on the construction schedule, the Contractor shall submit an activity hazard analysis of each major phase of work prior to entering that phase of activity. The analysis shall include major or minor hazards, as well as commonly recurring deficiencies that might possibly be encountered for that operation, and shall identify proposed methods and techniques of accomplishing each phase in a safe manner. The Project Superintendent and the Corps of Engineers Project Inspector shall sign the analysis. A copy of the analysis shall be kept on the job site and reviewed with employees during orientation and during weekly safety meetings.

1.9.3 Means of Escape for Personnel Quartered, or Working on Floating Plant

Two means of escape shall be provided for assembly, sleeping, and messing areas on floating plant. For areas involving 10 or more persons, both means of egress shall be through standard size doors opening to different exit routes. Where nine or fewer persons are involved, one of the means of escape may be a window (minimum dimensions 24 inches by 36 inches) that leads to a different exit route.

1.9.4 Signal Lights

The Contractor shall display signal lights and conduct his operations in accordance with the General Regulations of the Department of the Army and of the Coast Guard governing lights and day signals to be displayed by towing vessels with tows on which no signals can be displayed, vessels working on wrecks, dredges, and vessels engaged in laying cables or pipe or in submarine or bank protection operations, lights to be displayed on dredge pipe lines, and day signals to be displayed by vessels of more than 65 feet in length moored or anchored in a fairway or channel, and the passing by other vessels of floating plant working in navigable channels, as approved by the Secretary of the Army and the Commandant, U. S. Coast Guard.

1.9.5 Emergency Alarms and Signals

Alarms of the type indicated shall be provided in accordance with the following:

(a) Emergency Alarms - Alarms shall be installed and maintained on all floating plant requiring a crew where it is possible for either a passenger or crewman to be out of sight or hearing from any other person. The alarm system shall be operated from the primary electrical system with standby batteries on trickle charge that will automatically furnish the required energy during an electrical-system failure. A sufficient number of signaling devices shall be placed on each deck so that the sound can be heard distinctly at any point above the usual background noise. All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.

(b) Fire Alarm Signals - The general fire alarm signal shall be in accordance with Coast Guard Rules and Regulations for Cargo and Miscellaneous Vessels.

(c) Abandon Ship Signals - The signal for abandon ship shall be in accordance with the reference cited in (b) above.

(d) Man-Overboard Signal - Hail and pass the word to the bridge. All personnel and vessels capable of rendering assistance shall respond.

1.9.6 Head and Foot Protection

The entire work site under this contract is designated as a hard hat and foot protection area. The Contractor shall post the area in accordance with the requirements of EM 385-1-1, and shall insure that all prime and subcontractor personnel, vendors and visitors utilize hard hats and steel-toed shoes meeting OSHA requirements while within the project area.

1.9.7 Attendance at Safety Meetings

In order to allow for maximum attendance at weekly tool box (Safety) meetings, and monthly supervisor meetings by Corps of Engineers personnel, Contractors shall notify the Contracting Officer 5 calendar days prior to the start of work, of the time and location of all such scheduled meetings. The Contractor shall keep minutes and provide copies to all parties attending.

1.9.8 Safety Checks

Physical and visual checks for the safety of equipment as follows:

(a) Dredging Equipment and Associated Plant

All floating and operable equipment and machines, shall be checked for:

(1) Manufacturer's safety instructions, permanent-mounted and easily read.

(2) Guard Rails and life-lines at overboard access areas, as applicable.

(3) Cover for exposed moving parts with safety-guards to prevent someone from accidentally stepping or falling on them.

(b) Dozers, Front-End Loaders, Backhoes, and Other Wheeled-Tract Machines

Dozers, front-end loaders, backhoes, and other wheeled-tract machines operated at the placement area shall be equipped with rollover protection and seatbelts. All rotating or reciprocating parts, and any parts subject to high operational temperatures that are of such nature or so located as to be or become a hazard to the operating or attending personnel, shall be substantially guarded and insulated to the extent necessary to eliminate the hazard. Walking or working surfaces and platforms shall be of an anti-skid type. All front end loader, backhoe and other similar machines, such as tractors that utilize a backhoe attachment, shall be checked for:

(1) Exposed backhoe boom swing foot pedals.

(2) Backhoe boom swing lever that can be reached by a man standing on the ground or on the outrigger support bracket.

Where these type conditions exist, guards shall be fabricated to:

(1) Cover over exposed foot pedals to prevent someone from accidentally stepping on them.

(2) Enclose the swing lever so as to preclude operation from the ground or from the outrigger support bracket.

(c) Crawlers, Trucks, and Wheel-Mounted Cranes

(1) When a crane is performing duty cycle work (such as clamshell, dragline, grapple, or pile driving) it does not require anti-two block equipment. If the crane is required to make a non-duty cycle lift (for example, to lift a piece of equipment, a tool box, or supplies), it will be exempt from the anti-two block equipment requirements if the following procedures are implemented:

- an international orange warning device (warning flag, warning tape, or warning ball) is properly secured to the hoist line at a distance of 8 to 10 feet above the hoist rigging;

- the signalperson (or an individual designated as the signalperson) acts as a spotter to alert the crane operator with a "STOP" signal when the warning device approaches the boom tip and the crane operator ceases hoisting functions when alerted of this; and

- while the non-duty cycle lift is underway, the signal person shall not stand under the load, shall have no duties other than signalperson, and shall comply with the signaling requirements of EM 385-1-1;

(2) Anti-two block devices are always required when hoisting personnel by crane or derrick.

1.9.9 Diving Operations

All diving operations shall be planned in accordance with the Corps of Engineers Safety Manual EM 385-1-1 and must be limited to those tasks that cannot be accomplished in any other manner. The Contractor shall submit for approval all information which may affect the work to be accomplished, including divers names, medical examination reports, qualifications of all divers and top-side tenders to be employed in the diving operations, plant and equipment to be employed on the work, and a written dive plan with sketches and narrative descriptions for each phase of the planned dive.

1.10 BRIDGE-TO-BRIDGE RADIO COMMUNICATION

In order that radio communication may be made with passing vessels, all dredges engaged in work under this contract shall be equipped with bridge-to-bridge radio telephone equipment. The radio telephone equipment shall operate on a single channel very high frequency (VHF), FM, on a frequency of 156.65 megahertz per second with low power output having a communication range of approximately ten miles. The Federal Communications Commission has approved the frequency.

1.10.1 Radio

The Contractor shall provide the Government construction representative a portable radio capable of communicating with the dredge for the duration of work under this contract. The Contractor shall maintain the radio as required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PLACEMENT OF EXCAVATED MATERIAL

The contractor will be required to use the designated Government-furnished

Placement Area. The satisfactory material excavated shall be transported barges and scows and deposited by a hydraulic pipeline into the placement area as indicated and specified. The dredge pipeline shall be placed and advanced in a manner to traverse and disturb marsh and wetlands to the minimum amount practicable. Ingress and egress of personnel and equipment across marsh and wetlands areas shall be scheduled to coincide with high tide to the maximum extent practicable. The Contractor shall submit his proposed Dredged Material Placement Plan as a part of the overall work plan and the requirements of which shall be subject to approval of the Contracting Officer.

3.1.1 Dredged Material Discharge Requirements

The levees and spillboxes are expected to be adequate for the placement of dredged material proposed in this Solicitation; however, the Contractor is responsible to ensure all portions of the levees and spillboxes are adequate and in proper working order before commencement of placement operations. Any clearing or removal of debris, as well as any repairs to the spillboxes or levees that may be required, is the Contractor's responsibility and shall be provided at no additional cost to the government. The Contractor shall maintain the integrity of the dike and employ proper dredging techniques to assure dredged material is confined to the diked placement area at all times. The spillbox shall be well maintained with the boards at the correct level and free of trash and debris at all times. The Contractor shall immediately suspend dredging and placement operations in the event of any dike or containment failure. The Contractor may resume work only when such failures have been corrected. The Contractor may be required to recover at no additional cost to the Government any material improperly placed as a result of dike or containment failure. Damages and claims due to any failure of the dike due to construction error or negligence in operations is the responsibility of the Contractor. The Contractor shall install a baffle plate, diffuser, or other approved apparatus to the discharge end of the dredge pipeline that shall precisely control the placement of the dredged material and increase the settlement rate of the material to the maximum extent practicable. Upon completion of material placement operations, the entire interior area of the placement area shall be uniformly smooth-graded to assure positive drainage and elimination of undrained pockets and abrupt humps. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations. At the completion of the scheduled work, the Contractor shall leave the spillbox in a well-maintained and operable condition to assure adequate site drainage.

3.1.1.1 Water Quality Monitoring Controls

In addition to the requirements specified in subparagraph "Control of Dredging Area and Placement Area Effluent" of this SECTION, the Contractor shall take all precautions that in the opinion of the Contracting Officer may be necessary to minimize the escape of dredged material into the navigable waters. Water samples of nearby navigable waters shall be taken daily at locations approved by the Contracting Officer during dredging operations up current and down current from the dredge and placement area and after each change in tidal current flow up current from the dredge and placement area. These samples shall serve as the benchmark water quality standard for which measurements of samples taken in the vicinity down current of the dredging area and placement area shall be compared. Water samples from the water surface in the vicinity immediately down current of the placement area and at the spillbox shall be taken as often as necessary

to conform to the requirements as specified. Water samples immediately down current from the dredge and placement area shall be taken not less than once during each respective tidal current flow, and samples at the spillbox not less than twice daily. Density tests shall be performed on all water samples as outlined in paragraph titled "Control of Placement Area Effluent". In the event a water sample taken down current from the dredge, down current from the vicinity of the placement area, or at the spill box proves to be greater than 5 grams per liter in excess of the density of the water sample taken up current in the vicinity of the placement area or the area being dredged established as the benchmark water quality standard, dredging operations shall be stopped immediately or the discharge flow shall be reduced. Dredging can resume maximum operations once the difference in the density tests becomes less than 5 grams per liter. All samples taken shall be recorded by the contractor and included with the Daily Report of Operations. The Contractor shall provide constant monitoring of the placement operations when dredging and material placement operations are in progress. Monitoring personnel shall have fully functional two-way radio communications with the dredge operator at all times when dredging is in progress. Frequent communication checks shall be made to assure proper material placement during dredging operations. In the event of any communications failure or improper material placement is determined, all dredging and placement operations shall be immediately suspended until communications are restored as approved by the Contracting Officer, or in the event of improper material placement, until proper material placement procedures are reestablished by the Contractor as approved by the Contracting Officer. All costs resulting from suspensions of work as specified above shall be the responsibility of the Contractor and at no additional expense to the government.

3.1.2 Water Quality Monitoring Controls

In addition to the requirements specified in paragraph "Control of Placement Area Effluent", the Contractor shall take all precautions that in the opinion of the Contracting Officer may be necessary to minimize the escape of dredged material into the navigable waters. Water samples of nearby navigable waters shall be taken daily at locations approved by the Contracting Officer during dredging operations up current and down current from the dredge and placement area and after each change in tidal current flow up current from the dredge and placement area. These samples shall serve as the benchmark water quality standard for which measurements of samples taken in the vicinity down current of the dredging area and placement area shall be compared. Water samples from the water surface in the vicinity immediately down current of the placement area and at the spillbox shall be taken as often as necessary to conform to the requirements as specified. Water samples immediately down current from the dredge and placement area shall be taken not less than once during each respective tidal current flow, and samples at the spillbox not less than twice daily. Density tests shall be performed on all water samples as outlined in paragraph titled "Control of Placement Area Effluent". In the event a water sample taken down current from the dredge, down current from the vicinity of the placement area, or at the spill box proves to be greater than 5 grams per liter in excess of the density of the water sample taken up current in the vicinity of the placement area or the area being dredged established as the benchmark water quality standard, dredging operations shall be stopped immediately or the discharge flow shall be reduced. Dredging can resume maximum operations once the difference in the density tests becomes less than 5 grams per liter. All samples taken shall be recorded by the contractor and included with the Daily Report of Operations. The Contractor shall provide constant monitoring of the

placement operations when dredging and material placement operations are in progress. Monitoring personnel shall have fully functional two-way radio communications with the dredge operator at all times when dredging is in progress. Frequent communication checks shall be made to assure proper material placement during dredging operations. In the event of any communications failure or improper material placement is determined, all dredging and placement operations shall be immediately suspended until communications are restored as approved by the Contracting Officer, or in the event of improper material placement, until proper material placement procedures are reestablished by the Contractor as approved by the Contracting Officer. All costs resulting from suspensions of work as specified above shall be the responsibility of the Contractor and at no additional expense to the government.

3.2 DREDGING AREA AND PLACEMENT AREA CONTROL

The Contractor shall be responsible for the layout of all work and have all markings placed in the field marked by a licensed Professional Engineer or Surveyor currently licensed in the Commonwealth of Virginia. The markings shall be placed in the immediate work areas only and shall be removed once a work area has been accepted. The Government will establish the tide staff gauge within vicinity of the respective dredging areas. The in-place markings shall be verified by the Government before dredging and dredged material placement operations commence. The Contractor shall be responsible for dredging within the areas and prisms as shown, and to deposit the dredged material at the locations indicated. The Contractor shall establish and maintain at his own expense all markings of the dredging and placement areas and shall remove same upon completion of the work.

3.2.1 Electronic Survey and Positioning Systems

When the Contractor utilizes electronic survey and positioning systems to perform dredging and dredged material placement operations, all work accomplished with the use of the systems shall be reviewed and certified as accurate by the Contractor's Quality Control Manager. This signed certification shall be submitted as a part of the Daily Report of Operations and verify that all work performed with the use of the equipment and systems meets contract requirements. All markings to be placed in the field by the Contractor for layout of the work, including but not limited to placement area control points, pipeline routes, range markers and buoys, or for any other control purpose shall be provided by a professional engineer or surveyor licensed in the Commonwealth of Virginia. The Government reserves the right to verify in-place markings.

3.3 QUALITY CONTROL

The contractor shall establish and maintain a quality control system for all dredging operations to assure compliance with contract requirements and record his inspections and tests under this system.

3.3.1 Examination of Barges and Scows

The barges and scows shall be examined and determined to be in good condition to reasonably expect it to last throughout the job without wearing to the extent of allowing leaks. In the event that leaks occur anywhere in the barges or scows the contractor will be required to immediately discontinue using the respective equipment until the leaks are stopped or equipment replaced. The contractor will also be required to recover at no cost to the Government any material improperly placed because

of a leak or leaks in the equipment.

3.3.2 Warning Signs

The contractor shall erect and maintain at his own expense suitable navigation warning signs at each end of a submerged pipeline and at any other points necessary to prevent hazards to navigation.

3.3.3 Examination of Pipeline

The pipeline, including connections used for a submerged line, shall be examined and determined to be in good condition to reasonably expect it to last throughout the job without wearing to the extent of allowing leaks. In the event that leaks occur anywhere in the pipeline, the contractor will be required to immediately discontinue using the respective equipment until the leaks are stopped. The contractor shall also be required to recover at no cost to the Government any material improperly placed because of a leak or leaks in the equipment.

3.3.4 Inspections and Testing Requirements

Inspections and testing shall be the responsibility of the Contractor, subject to the approval of the Contracting Officer.

3.3.4.1 Control of Dredging Area and Placement Area Effluent

The density of the effluent shall be determined by a hydrometer or weight-volume method as hereinafter specified. The Contractor will have the option of the hydrometer method when settled solids are not present in the sample. When settled solids are present the weight-volume method shall be employed for density determinations. The same technique shall be used for making the water density determinations in the vicinity of the benchmark area as in the respective work and placement areas. When the hydrometer is used, an instrument such as Fisher Brand #14-331-5C2, or approved equal, shall be used. When the weight-volume method is employed, a 1,000 c.c. laboratory cylinder and a scale or balance capable of weighing the sample and cylinder to the nearest gram shall be used.

3.3.5 Equipment and Machinery Requirements

All measuring equipment, global positioning systems (GPS) and other electronic positioning systems, data plotting and recording equipment, and the procedures associated with each respective item of equipment, shall be subject to the approval of the Contracting Officer. Verification of current calibration for each respective item of equipment, as approved by the Contracting Officer, shall be provided by the Contractor prior to use of the equipment on the work. All records produced by the equipment shall be inspected and certified as complete by the Contractor's Quality Control Representative and included as a part of the Daily Quality Control Report.

3.3.6 Miscellaneous Inspections and Test Records

A copy of the records of all inspections and tests, as well as record of corrective action taken, shall be included in the Control Plan and furnished to the Contracting Officer as a part of the Daily Quality Control Report.

3.3.7 Reporting and Certificates

All measuring, plotting, and recording equipment and procedures shall be subject to the approval of the Contracting Officer. Verification of their calibration, certified by the Contractor's Quality Control Representative, shall be furnished prior to use on the work. All records produced by the equipment shall be authenticated by the authorized representative of the contractor and then provided to the Contracting Officer with the Daily Report of Operations.

3.4 DAILY REPORTING REQUIREMENT

The Contractor shall prepare and maintain a Daily Report of Operations and furnish copies daily to the Contracting Officer. A copy of the form prescribed for recording the required information and any further instructions on the preparation of the report will be furnished at the preconstruction conference noted in Section 01005. The Contractor shall also furnish the following item daily to the Contracting Officer during dredging operations:

- (1) Copy of dredge leverman's log
 - (2) Records of dredge pump vacuum and pressure gauge readings
- End of Section --